DOCUMENT RESUME

ED 074 446 CS 000 393

AUTHOR Goodman, Kenneth S., Ed.; Fleming, James T., Ed.
TITLE Psycholinguistics and the Teaching of Reading.
INSTITUTION International Reading Association, Newark, Del.
PUB DATE 69
NOTE 95p.
AVAILABLE FROM International Reading Association, 6 Tyre Avenue, Newark, Del. 19711 (Order No. 907, $3.50 non-member, $3.00 member)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Beginning Reading; Cultural Differences; Decoding (Reading); Language Development; *Linguistic Competence; Phonology; *Psycholinguistics; Reading Comprehension; *Reading Instruction; *Reading Processes; *Reading Skills; Spelling

ABSTRACT

Selected by the International Reading Association's Committee on Psycholinguistics and Reading, the papers in this volume were first presented at the 1968 IRA Preconvention Institute: (1) "Reading Is Only Incidentally Visual" (Kolers) suggests that the teaching of reading should move away from the purely visual; (2) "Some Thoughts on Spelling" (Halle) discusses the principle that orthographies must contain no symbols that reflect the operation of phonological rules; (3) "Words and Morphemes in Reading" (Goodman) explores the lack of one-to-one correspondence between words and morphemes and the implications for reading instruction; (4) "Some Language and Cultural Differences in a Theory of Reading" (Shuy) focuses on the child's environment and how he learns language symbolization; (5) "An Operational Definition of Comprehension Instruction" (Bormuth) argues that instruction in reading comprehension is poor as a result of little valuable research; (6) "Psycholinguistic Implications for a Systems of Communication Model" (Ruddell) discusses selected variables related to decoding and comprehension; and (7) "The Teaching of Phonics and Comprehension: A Linguistic Evaluation" (Wardhaugh) discusses the premises behind existing methods of beginning reading instruction. The final chapter, "Component Skills in Beginning Reading" (Calfee and Venezky) appears in the ERIC system as ED 064 655. (HS)

ED 074446

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Psycholinguistics

and the

Teaching of Reading

Editors

KENNETH S. GOODMAN and JAMES T. FLEMING

Selected papers from the IRA Pre-Convention Institute held in Boston, April 1968

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL HAS BEEN GRANTED BY International Reading Assn.
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE U.S. OFFICE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER."

International Reading Association
Six Tyre Avenue · Newark, Delaware 19711

CS 000 323

INTERNATIONAL READING ASSOCIATION

Officers

1971-1972

President THEODORE L. HARRIS, University of Puget Sound, Tacoma, Washington

President-Elect WILLIAM K. DURR, Michigan State University, East Lansing, Michigan

Past President DONALD L. CLELAND, University of Pittsburgh, Pittsburgh, Pennsylvania

Directors

Term expiring Spring 1972

THOMAS C. BARRETT, University of Wisconsin, Madison, Wisconsin
CONSTANCE M. MCCULLOUGH, San Francisco State College, San Francisco, California
EILEEN E. SARGENT, Nicolet Union High School, Milwaukee, Wisconsin

Term expiring Spring 1973

MARJORIE S. JOHNSON, Temple University, Philadelphia Pennsylvania
ROBERT KARLIN, Queens College, City University of New York, Flushing, New York
OLIVE S. NILES, State Department of Education, Hartford, Connecticut

Term expiring Spring 1974

WILLIAM ELLER, State University of New York, Buffalo, New York
WILLIAM J. IVERSON, Stanford University, Stanford, California
EUNICE SHAED NEWTON, Howard University, Washington, D. C.

Executive Secretary-Treasurer RALPH C. STAIGER, University of Delaware, Newark, Delaware

Assistant Executive Secretary RONALD W. MITCHELL, International Reading Association, Newark, Delaware

Publications Coordinator FAYE R. BRANCA, International Reading Association, Newark, Delaware

---

Program arranged by the IRA Psycholinguistics and Reading Committee

PAUL DAVID ALLEN
ALTHEA BEERY
JOHN BORMUTH
ROBERT CANFIELD
JAMES T. FLEMING
RICHARD HODGES
PAUL KOLERS
CARL LEFEVRE
JANE LEVINE
ROGER SHUY
WENDELL W. WEAVER
KENNETH GOODMAN, Chairman

Copyright 1969 by the International Reading Association
Second printing January 1972

FOREWORD

Psycholinguistics is, as its name implies, an interrelationship of the disciplines of psychology and linguistics. The linguist, particularly during this decade, has presented the educator with accurate descriptions of language and with new insights for the teaching of reading. The psychologist has continued his explorations of learning theories and has been reexamining psychological aspects as they may apply to reading instruction. The psychologist has combined the efforts of both disciplines and is primarily concerned with developing theories of language performance based on sound linguistic and psychological principles.

This significant publication is the result of over a year's work by IRA's Psycholinguistics and Reading Committee, 1967-68. The committee, headed by Dr. Kenneth Goodman, Wayne State University, planned a pre-convention institute on the topic for IRA's thirteenth annual convention. The papers included in this volume were presented at the institute.

Perhaps there is no other topic related to reading instruction as important today as psycholinguistics. There are many conceptions and misconception about linguistics and, indeed, psycholinguistics as they apply to reading instruction. The field has been flooded with materials labeled "linguistic." Certainly the psycholinguist is helping and will help the reading specialist to make use of psycholinguistic insights as the reading specialist develops, uses, and evaluates materials.

But, all the evidence is not yet in. We are still learning. Good judgment must be paramount in deciding upon strategies and materials that will best serve the learner. The 1968-69 Psycholinguistics and Reading Committee has planned a segment of the fourteenth annual convention in Kansas City, April 30-May 3, 1969. Undoubtedly, their next contribution will supply additional ideas and spark heightened insights for the reading instructor to assimilate and utilize.

H. ALAN ROBINSON, *President*
International Reading Association
1967-1968

The International Reading Association attempts, through its publications, to provide a forum for a wide spectrum of opinion on reading. This policy permits divergent viewpoints without assuming the endorsement of the Association.

Contents

H. Alan Robinson	iii	Foreword
James T Fleming	1	Introduction
Paul A. Kolers	8	Reading Is Only Incidentally Visual
Morris Halle	17	Some Thoughts on Spelling
Kenneth S. Goodman	25	Words and Morphemes in Reading
Roger W. Shuy	34	Some Language and Cultural Differences in a Theory of Reading
John R. Bormuth	48	An Operational Definition of Comprehension Instruction
Robert B. Ruddell	61	Psycholinguistic Implications for a Systems of Communication Model
Ronald Wardhaugh	79	The Teaching of Phonics and Comprehension: A Linguistic Evaluation
[Robert C. Calfee and Richard L. Venezky	91	Component Skills in Beginning Reading]

[This article is omitted as it is already available from the ERIC system as ED 064655]

Introduction

JAMES T. FLEMING
University of California at Los Angeles

By establishing the Committee on Psycholinguistics and Reading, IRA has quite appropriately encouraged its membership to consider the nature of reading from the combined vantage of those who look closely at learning and those who look closely at language. By professional commitment many educators have, of course, long been concerned with the problems of teaching reading, whether as classroom teacher, teacher of teachers, reading specialist, school administrator, curriculum supervisor, or educational researcher. Many psychologists, too, in their investigations, have known that one of the better vehicles for observing learning and instruction has been the focus of their attention on reading behaviors, called the reading process by some. Quite a smaller but still significant number of linguists, in exploring the nature of language, have also at times found it instructive to look at a very common use of language—reading. Currently there is a growing number of individuals who have combined an interest and competence in examining the phenomena of both learning and language—hence the designations psycholinguists and psycholinguistics.

It is particularly fortunate that a fair number of those who have been trained as psychologists, linguists, or psycholinguists have begun to consider seriously with educators the scope of the problems involved in the teaching of reading, for it is their combined training, experience, knowledge, insight, and research which inform the rationale for establishing this Committee on Psycholinguistics and Reading. The hope of this committee is that from such a variety of backgrounds and points of view a broader base of support will be formed from which a common ultimate goal can be pursued even more rigorously—namely, the furtherance of literacy.

Today one is painfully aware of the functional necessity of literacy for all citizenry. The price of illiteracy is clear; the penalties exacted by a literate society are increasingly stringent and personally harsh. It seems, then, especially fitting that the IRA has taken the lead in inviting those from other disciplines to join with its own membership in the best of interdisciplinary research on the teaching of reading.

The papers in this volume represent the first formal efforts of the Committee on Psycholinguistics and Reading to bring to a larger audience some major concerns. The goal is not a consensus but a sampling of diverse views from the constituent disciplines. There are psychologists who would look at reading as a set of behaviors which can be prescribed, observed, and elicited—all in accord with a carefully prepared set of stimuli. There are other psychologists who would insist that reading is primarily a problem-solving process. In an oversimplified manner, one might say that the views of the first mentioned psychologists would suggest a passive learner; whereas, the views of the latter might suggest an actively engaged learner. In considering the relationship between these views and those of a linguist who looks at reading as primarily a language-based skill, one is going to find clear and frequent differences. This is to be expected and should not be a cause for alarm or despair.

It should be noted at the outset that at certain levels of discussion, what one calls "reading" can cause some of the sharpest differences. For example, rather comprehensive models of reading are often proposed to justify or explain specific principles and practices of teaching reading, and the complaint is heard that the model is overly elaborate. Unfortunately, simply because some models are complex they are dismissed too quickly in the mistaken belief that there must be a simple way or answer. The temptation to settle for a simple solution is understandable, for the insistent tasks of reading are urgent and universally demanding. The promise of immediate, or at least practical, assistance is accepted by not only the gullible or the uninformed; practicality in the guise of "common sense" is frequently the choice of the dedicated and the disenchanted alike. It can, simply, also be the choice of the tired, the overworked, and the underappreciated. Whatever the causes, the results of implementing a narrowly conceived model of reading usually are fairly predictable: some children will learn to read, and some will not; but rarely is one secure with his reasons for the successes or, more important, the failures.

One of the fundamental reasons not much has been added to the stock of knowledge about the reading process is that it has been unclear from the start as to the sort of performance one is really after and what evidence will satisfactorily indicate that one has achieved what he set out

to do. The result is that frequently one continues to offer the child the same options to fail.

Differences over the definition of reading not only divide educators but also those who hold contrasting views of the nature of language and the nature of learning. In many respects, the kinds of questions, the methods used to answer these questions, and the sort of evidence which will be acceptable will usually reveal the differences in the psychological or linguistic models to which the investigator pledges his allegiance. When these differences collide in theoretical battle (as they must in circumstances where honest, open, and informed debate is encouraged), the impact frequently is perceived by those who are not intimately involved as random, sometimes senseless chattering or possibly just picayune bickering. These differences do matter however; they matter a great deal. The differences are concerned not necessarily with who has the truth—be it the educator of a certain persuasion, the psychologist of a certain kind, or the linguist of a certain school. The crucial concern is determining whose theory can most adequately account for the bits and pieces of what is already known about reading and its relation to language learning. It is essentially an issue of determining the relative degree of explanatory power which can be derived consistently from a theoretical construct.

There probably never will be universal agreement (even if this state of affairs were desirable); however, the healthy, forceful competition of conflicting theories forces adherents to examine their theories and deal with realities, resulting in better understanding of areas of disagreement as well as substantial areas of agreement. In any case, the potential significance of what the psychologist and the linguist can contribute to the understanding of reading cannot be ruled out—out of hand. It is just when a field, whether it be psychology or linguistics, is in a state of rapid change that one expects the most significant progress from it. The best of scholarly research should reflect a state of change, and the best of scholarly research from the disciplines of psychology and linguistics can and should be brought to bear on some of the problems of reading.

Only a few of the relevant issues which could profit from the combined attention of psychologists, linguists, and educators, would include these examples:

1. the question of whether (or to what degree) dialectal variations pose a barrier for some children learning to read.
2. the development of better beginning reading materials for the child who is not a native speaker of English.

3. the implications for "programing" beginning reading materials if one accepts the notion that phonemes are merely "convenient linguistic fictions" or "methodological artifacts."
4. the need to assess mature acts of reading as information-processing or problem-solving tasks, particularly from the point of view of complex visual perceptions.
5. the necessity of constructing a convincing, comprehensive model of just what reading is all about.
6. a long-overdue scrutiny of the entire notior of comprehension.
7. an incisive analysis of the relevant dimensions of language descriptions for reading research.
8. a close look at the oral reading errors made by mature as well as immature readers in a variety of circumstances—their hesitations, false starts and omissions (of parts of a text); their insertions (of parts which do not appear in the text); and their self-corrections.
9. a searching reconsideration of the worth of phonic generalizations including a more basic examination of the English spelling system as it relates to oral language.
10. the need to know what language "knowledge" a child brings to his reading tasks; that is, what he is best capable of using.

Among many others, these issues are reflected in the interdisciplinary concerns expressed by the psychologists, linguists, and educators who have contributed the papers to the first public showing of the IRA Psycholinguistics and Reading Committee. If at times the discussion appears to the newcomer to the field of psycholinguistics to depart radically from thought and practice in the field of reading, it is well to keep in mind that change has been both radical and swift in the very fields of psychology and linguistics and that joint efforts by workers from both fields should be expected to produce novel, highly productive new ways of looking at old problems. Although many factors undoubtedly could be singled out to account for the sometimes rather large gap between the findings ot interdisciplinary research and teaching practices, only a few will be considered briefly.

For many teachers and researchers of reading, some aspects of psychology have always been more familiar and frequent companions than the field of modern linguistics. The major focus, after all, has for some

time now been on the learner and the learning process. Apart from what elsewhere has been called the "Wonder of Words approach to language," linguistics, however, has in all likelihood appeared only relatively recently to many who have long taken for granted most of the features of their oral and written language. For whatever reasons, almost three decades have passed since a noted linguist took severely to task those writers on the reading process who apparently had either ignored, overlooked, or confused some fundamental tenets of a scientific study of language. Despite the fact that this linguist's challenge was expressed in the pages of a widely-distributed teachers' journal, there was no wide-ranging response. Apparently there was not much attention at all paid to the charges until two decades later when Bloomfield's linguistically-oriented reading materials were posthumously published along with his earlier challenging essays. It is at this point likely that a good many researchers and teachers of reading had their first encounter with linguistics. And the encounter may not have been an altogether pleasurable one. There was, on the one hand, the usual rash of "promising potential" which was loudly noted; there were those who could not wait to climb aboard the fast-moving bandwagon. There was, on the other hand, a wholesale denial of "anything new" or "anything worthwhile" usually from misinformed or uninformed, if well-intentioned, sources. There were also a few, but only a few, well-reasoned cautions and requests for restraint. In all, there was more than mild confusion in many quarters, much of which might have subsided in time if another internal development had not occurred in linguistics, one which thrust itself aggressively onto the scene: the notion of transformational-generative grammar. In the early 1960's, at about the same time that Bloomfield's reading materials were being published, this bold, new theory of linguistics was becoming known; and much of the theory, methodology (indeed the over all conception or orientation toward language study), was to be subjected to a most rigorous, formal analysis, an analysis which would bring about profound changes in the field of linguistics. The ramifications of this change in linguistics included for many psychologists (psycholinguists whose work it is to ascertain the psychological reality of posited language phenomena) the opening or reopening of a whole range of heretofore restricted, or at least unfashionable, avenues of enquiry. Particularly, study of the relationship of syntax and meaning became a major concern. To come roughly to the present, this first assessment of transformational-generative grammar would undergo yet another major reformulation, resulting in a very systematized, elaborate, and formal (though still controversial) approach to the nature of language.

To minimize the newness, the unsolved problems, or the sharpness of the differences which still exist within and among the various schools of thought in linguistics and, consequently, in psycholinguistics, would at best serve only to deceive. One should, however, note briefly some shifts in emphasis which can profitably be incorporated in much reading research. There seems to be, for example, far less concern in some quarters with solely categorizing or describing, an approach which many educators—particularly reading researchers and teachers—have perhaps come to rely on to far too great an extent. The resultant risk of such an overriding concern with description is of course the absence of a well-developed, sufficiently analyzed, underlying rationale or reasoned theory. Rather than continuing to organize certain facets of reading into discreet categories so as to be able to describe only *what* something *looks like* or *is* at one point in time and space, a greater emphasis would be placed on understanding how one level of behavior is related to the other and hence to a great number of acts. Such a shift away from a purely taxonomic approach reflects probably a dissatisfaction with even the best of tidy arrays of pigeon holes, levels, or steps, none of which has anything much to reveal in any logically satisfying fashion about the relations *between* those holes, levels, or steps—to say nothing of the mechanisms underlying these relations.

Despite some differences in approach in this interdisciplinary area of psycholinguistics—and in this context psycholinguistics and reading—one trend is quite clear: there can be no return to a search for simple answers to what one has come to recognize to be complex questions. Although some trends or concerns in reading have in the past appeared to be cyclical (a rise and decline, for example, in the acceptance and use of a variety of techniques grouped under the general rubric *phonics*), exclusive adherence to such concerns now can only further deter one from the more crucial issues which remain unresolved. There can be little argument with the recognized need for a theoretically adequate model to explain the depth and complexity involved when one deals with reading. Concomitantly, a hardly inconsequential issue which bears repetition in explicit fashion is the increasing emphasis being placed on the *active*, participatory nature of the child's responses as he relates to reading tasks.

Summary

The interdisciplinary research represented in the papers of this volume cannot be expected to provide either simple or immediate answers to many problems in reading. The results of such working together

can, however, be expected to pare away some of the more superficial or unproductive concerns and point up those areas most in need of specialized attention. Some linguists have learned to work well with some psychologists. The papers of this volume give every indication that an equally reciprocal and mutually profitable relation can be shared by psycholinguists and educators whose major responsibilities are to reading research. The more one can know about the nature of language—its acquisition, use, and its users as well—the more one may be able to establish and implement informed priorities in continued efforts to effect sound and workable reading programs.

Reading Is Only Incidentally Visual

PAUL A. KOLERS
Massachusetts Institute of Technology

The study of the reading process, discussions of how reading should be taught, psychological experiments on the perception of letters and words—all of these activities and many more have been concerned with the visual aspects of reading. Good reason motivates much of this work. One knows from many sources that some of the letters of the Roman alphabet are ambiguous; that even skilled readers misperceive letters and words; and that, indeed, if one were not dependent upon one's visual system for normal reading, books could be made of blank pages and man would be none the more ignorant. Normal reading is heavily dependent upon visual inputs, and perhaps because of this dependency early reading instruction emphasizes the distinctively visual aspects of letters and words. Children are taught to differentiate and to name the letters of the alphabets, to identify their sound-class translations, and to recognize words by their visual shapes. But the visual is only one aspect, only one part of the reading process. While an important part, it has been seriously overstressed, in the writer's opinion, both in practice and in theory. Consequently, some experiments and their implication will be emphasized to show how little reading may depend upon the visual component. In particular, it will be shown how the principal characteristic of a visual object, its geometry, can by itself tell little about its perception.

The method here is not theoretical but experimental. Indeed the literature on literacy is surfeited with theoretical accounts, many of them aprioristic, and is singularly underdeveloped in the area of serious data about the constituents of literacy, the components of this process taken so much for granted. It is appalling to note the mounds of literature—journal articles, books, symposia—that have accumulated on the subject of reading and how little solid knowledge there is about the process.

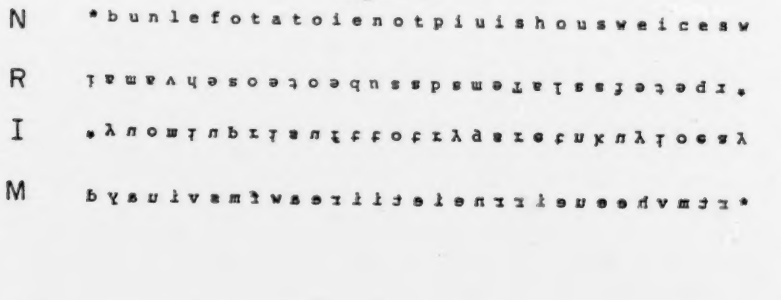
One would think that with a topic of such importance, people interested in the subject would try to find out how the phenomenon occurs rather than merely make pronouncements about it. The subject matter of the reading process in its present development repeatedly brings to mind the anecdote told about medieval scholastics. At an important conference called to decide how many teeth a horse had, these good schoolmen argued fiercely and debated long and hard on the matter. Authorities from Aristotle to Aquinas were cited; sacred books were consulted; the veracity of witnesses and even of authorities was called into question; accusations and counteraccusations were made; insults hurled as steam, sound, and fury characterized the proceedings. Eager to quiet the spirits of his revered masters, one young acolyte finally worked up the nerve to interject a comment, a suggestion that he thought would help to solve the matter. He offered to catch a horse and count the number of its teeth. Deadly silence greeted the suggestion; and then, on a signal from the chairman, the poor acolyte was thrown to the wolves. Empiricism, pragmatism, some effort at informed fact-gathering had neither charm nor interest for those medieval philosophers. The writer fears that a similar lack of respect for data characterizes many contemporary students of literacy. By data here is not meant the mounds of correlational statistics and the millions of reading comprehension and reading achievement scores that have been tabulated. Such data can tell one very little. What is needed are data that illuminate the processes that characterize reading and that raise questions rather than "prove" theories—in a word, data that are analytical, not merely descriptive. The study of literacy provides little data of this kind. Indeed, there has been little worthwhile data since E. H. Huey's masterpiece, *The Psychology and Pedagogy of Reading,* was published in 1908.

In order to experiment on literacy analytically, it is necessary to alter the nature of the test material. The reason is that normal connected discourse presents little challenge to the skilled reader, and little can be learned about the reading process by studying the way he reads such material. The writer has concentrated his experimentation on moderately skilled readers—college students—on the assumption that what they do can tell what the child has to learn how to do: The performance of skilled practitioners shows the target that the novice must shoot at. But reading by the skilled practitioner is a skill so overlearned that in order to be able to see what he is doing, one must complicate the reading task. The writer complicated the task for the skilled practitioner by distorting the material to be read and studying the way the reader accommodated himself to the distortion. His performance revealed some aspects of the process often called code-breaking.

In one set of experiments college students were required to name letters that had been transformed geometrically. The letters had been transformed in sixteen different ways, eight of which are illustrated in

Figure 1. The text was derived from a page of normal connected discourse. In the upper set of four transformations individual letters have been subjected to simple rotations in three-dimensional space: Normal (N), rotation in the plane of the page (R), mirror reflection (M), and inversion (I). In the lower set of four, Pseudowords, other transformations are shown.

Figure 1



If one considers only individual letters, each set of eight transformations produces four pairs of geometrically identical objects. For example, individual letters are identical in N and rM, in R and rI, in M and rN, and in I and rR. In four of the cases the subjects named the letters from left to right; however, in the other four, naming went from right to left. In one set of eight arrangements, designated "letters," every letter was actually followed by a space, as in the upper part of Figure 1. In another set of eight, Pseudowords, the letters appeared in groups, as in the lower part of Figure 1. In both cases the subjects were required not to read but to name accurately the letters aloud as rapidly as they could. There were 832 letters on each page in the Letters condition and 1170 on each page of Pseudowords. The amount of time subjects took to name all the letters on a page, excepting the first line, was measured; that is, the time required to name 800 letters in Letters and about 1100 in Pseudowords. The time required to name the first 800 letters of Pseudowords after the first line, in order to compare those results with the Letters condition, was also noted.

The data are set out in Table 1 as four pairs of comparisons. The times that were taken to name the characters are shown for each pair. Note that in each pair identical characters are being named, but from left to right for the upper member and from right to left for the lower. Notice, too, that in the first comparison, N and rM, the subjects were naming letters of the Roman alphabet in their normal orientation; yet the amount of time taken to name them is not the same in the two cases.

TABLE 1

Time Taken to Name Letters (Min.)

Transformation	*800 Letters*	*800 Letters in Pseudowords*
N	4.65	4.51
rM	5.66	6.16
I	7.96	8.77
rR	8.55	9.56
rN	7.06	7.86
M	7.20	8.04
rI	7.16	8.33
R	6.72	7.64

The point to be made is that there is much more to the recognition and naming of characters than at first might appear. The sheer geometry of the characters is not enough to specify their recognizability—as shown by the fact that characters in identical orientations require different amounts of time to be named, according to the direction of naming. It should follow that as their geometry is not sufficient to explain their recognition, it surely cannot explain their being read.

Perhaps tachistoscopic studies are the best proof that word recognition does not require the identification of each of the letters in a word. In those studies (*8*), as most people know, words spelled correctly are often misperceived and pseudowords are identified as real similar-looking words. The point to be made is that recognition in any case is not a reproductive process but a constructive one. The perceiver does not have a "photographic image" in his mind; rather, what he has there, he has put there by constructing an experienced object out of a set of clues by means of various mental operations. Contrast the response to a flash of light and to a word. A flash of light is a stimulus that has a certain necessary property to its response: The light induces a response in the retina that travels along the optic nerve in well-known

ways. Words presented visually are another matter, for in order to identify them at all one has to know something about them. A string of letters that spell a word in Turkish or Hungarian is recognized much more easily by someone who knows those languages than by someone who does not. The response in this case does not have the rigid stimulus constraints that a flash of light has. Furthermore, a cat, too, will respond to a flash of light but is likely to be indifferent to whether the words flashed at him are in Hungarian, Turkish, or English. This is a roundabout way of saying that certain kinds of stimuli elicit similar responses over a wide range of individuals tested and that other kinds of stimuli do not. Words presented visually are in the latter category. (There are analytical difficulties with this classification, but it will do to make a point. Compare Eden, 1968, and Goodman, 1968.)

In the sense outlined, then, words are "ambiguous" stimuli: there is no "natural" response to a word, but there is a "natural" response to a flash of light. One does not have to learn how to respond to a flash of light, for the response is part of one's physical endowment. But one does have to learn how to respond to a word. What happens then when skilled readers are required to read relatively unfamiliar sequences of words? Obviously, they have more difficulty doing that than reading more-familiar sequences, as the following illustrates.

The subjects were French-English bilinguals (*4*). They were required to read passages aloud in English, passages in French, and passages in which words were mixed haphazardly in the two languages. When reading French, the subjects used a good French accent; and when reading English, a good English accent. Their performance in reading the combination is the matter of interest here. Many times the subjects read English words aloud with a French accent and French words with an English accent. American subjects sometimes said "block" for *black*, pronounced *moats* as the French word *mots* and *warden* as "vahrdhan". Native speakers of French, on the other hand, pronounced *murs* as the

Figure 2

Examples of Mixed Text

His horse, followed de deux bassets, faisait la terre résonner under its even tread. Des gouttes de verglas stuck to his manteau. Une violente brise was blowing. One side de l'horizon lighted up, and dans la blancheur of the early morning light, il a perçut rabbits hopping at the bord de leurs terriers.

Son cheval, suivi by two hounds, en marchant d'un pas égal, made resound the earth. Drops of ice se collaient à son cloak. A wind strong soufflait. Un côté of the horizon s' éclaircit; et, in the whiteness du crépuscule, he saw des lapins sautillant au edge of their burrows.

English *moors flânerie* as the English *flannery*, and *gardera* as if it were English. The point to be made here is that the printed words themselves did not convey any information about how they should be pronounced. These results were not strictly a matter of practice or of learning because in the cases cited the subjects were mispronouncing words in their native language, not a foreign language; they mispronounced the latter as well. Consider words with accent marks on them. No truly English words have accent marks. Words that appeared with accent marks in the experiment could only be French. Nevertheless, even accented words were mispronounced, native speakers of French and of English sounding the words out as if they were English. Clearly, reading is not a simple matter of translating familiar visual graphemes into phonemes.

There are two other kinds of "error" that the subjects made in this experiment. When reading aloud passages that were partly in English and partly in French, the subjects often said the translation of the printed word. The printed word might have been "porte" and the subject said "door" or vice versa. *De sa* might have been printed and the subjects said "of his" or vice versa. These spontaneous translations always preserved the meaning of what was being read, of course, but they did not preserve the phoneme-grapheme correspondence. Indeed, while "door" may be related to "porte" etymologically, Grimm's Law of phoneme shift would have to be invoked to find a phoneme-grapheme "correspondence" between the two words.

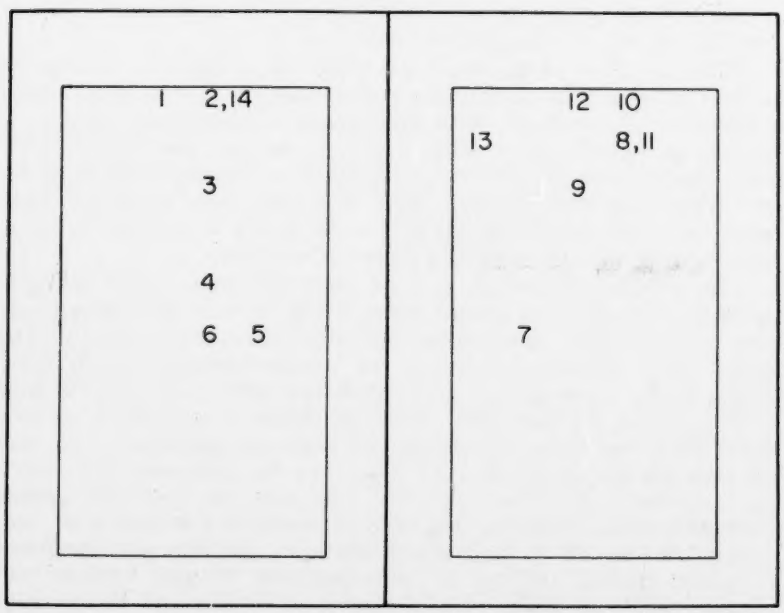
The syntactic arrangements of words also played a role in the subjects' reading. The rules used for constructing mixed passages created a number of instances in which the characteristic syntactic sequence of words was violated. In reading sequences such as *une violente brise* and *made resound the earth* the subjects often "rectified" the sequence by saying "une brise violente" and "made the earth resound." Here again they were not being faithful to the words as printed, but they were being faithful to the messages the words conveyed.

As pointed out earlier, if there were not some visual attention directed to the word as printed, there would be very little correspondence between what was printed and what the subject said he had read. Under normal circumstances the correspondence is usually fairly good. But correspondence between what and what? Can subjects after reading a page say how many words or sentences there were, or how many times declarative or interrogative sentences appeared? Can they tell how big the letters were or what was the frequency with which particular letters or words appeared? Can they say how many words were misspelled or what the first word of successive sentences was? Obviously the answer is "no" to all of these questions for conditions of normal reading. Indeed, in one experiment bilingual subjects read passages whose sentences were alternately in English and French (*4*).

Subjects could always tell what the passage was about—that is, what message had been conveyed—but only rarely could they say in which language they had read a particular fact. Thus, the correspondence spoken of between what is written and what the subject says he has read is clearly a semantic or informational correspondence. By "correspondence" is meant that the reader got the message; usually he is entirely indifferent to the means by which he got it. The message and the medium are quite different aspects of literacy. If this correspondence is what is known as "reading for meaning" and if the goal of successful reading is reading for meaning, why must instruction in reading emphasize, as the writer is told it does, a concern with visual details and visual operations?

One other set of data is relevant to the writer's observations. Some people develop the ability to read very rapidly, often without formal instruction in the skill. Recently, Taylor (*7*) summarized a series of studies on the eye movements of rapid readers; Llewellyn-Thomas (*6*) has provided some numerical data. Taylor's finding was that no systematic pattern characterized the eye movements of speed readers. The same people were variable from page to page, and different people scanned the same page in different ways. Figure 3 shows the fixation loci of

Figure 3



a very rapid reader, from eye-movement data taken from Llewellyn-Thomas. This reader, like most readers, fixated about three times per second. Note that she went down the middle of the left-hand page and up the middle of the right-hand page, with no fixation in the bottom third of either page. On other pairs of pages, her eye movements were different: Sometimes she had three or four fixations in a particular region of a given page; sometimes she scanned back and forth between the pages, and so on.

The point to be made is that there is no necessary serial sequence to the rapid reader's scanning of pages. Yet, by most kinds of objective tests, he usually has a good idea of what he has read. He has attained an information-transfer from the printed page to his own mind. It seems obvious that the transfer has been effected by the reader's constructing in his own mind a representation of what he has been reading about. This representation is thematic or semantic or informational—no single word exists to describe it—and not literal. In effect the reader tells himself a story, one based on clues he has picked up from his rapid scanning of the array of printed words.

Not all reading needs to nor should it proceed in this way. Much reading may, however. The writer's suggestion, therefore, is that the teaching of reading move away somewhat from the purely visual and the purely geometric—even from the symbol-sound relations that are now being taught—and emphasize somewhat more the clue-search and information-extracting characteristics of reading. This suggestion is by no means novel, but from Huey's day on it seems to have been acted on only intermittently, and then only half-heartedly. Instruction tends to preserve the historical sequence of literary development of a system for phonetic transcription. There is no reason in principle that requires that the sequence of instruction follow the analytical sequence of development and discovery from letters and their sounds to words, then to phrases, and finally to meaning. *

A similar principle long characterized the teaching of mathematics. Students first learned arithmetic and then algebra and then geometry and then trigonometry and then analytical geometry and then calculus in its various aspects and then finally came to modern algebra and set theory. The sequence of instruction followed the sequence of invention: Modern algebra was at the apex, and modern algebra came last. The revolution in the teaching of mathematics developed by using the principles and discoveries of set theory and modern algebra to reformulate the principles taught in the early stages; the further change has been

* This developmental sequence of phonetic transcription actually violates the historical sequence of linguistic representation. The earliest writing systems were pictorial and representational: the meaning of the message was fairly clear to anyone who could recognize the objects pictured. Nonrepresentational alphabetic writing is a fairly late invention (*3*, *5*).

to teach principles rather than sheer computational techniques. The teaching of reading has been ripe for a similar "revolution" for about 500 years, but it still has not come to pass. As Huey emphasized, reading is an information-gathering activity principally. Would it not be useful to attempt its teaching in those terms and move a little distance away from the "purely computational" aspects of letter recognition and phonics? Does the constructive process on which comprehension depends really require tedious drill in such primitive elements as letters, sounds, and words?

REFERENCES

1. Eden, M. "Other Pattern Recognition Problems and Some Generalizations," in P. A. Kolers and M. Eden (Eds.) *Recognizing Patterns.* Cambridge, Mass.: M.I.T. Press, 1968.
2. Goodman, N. *Languages of Art: An Approach to a Theory of Symbols.* Indianapolis and New York: Bobbs-Merrill, 1968 (in press).
3. Huey, E. B. *The Psychology and Pedagogy of Reading.* New York: Macmillan, 1908; Paperback reprint; Cambridge, Mass.: M.I.T. Press, 1968.
4. Kolers, P. A. "Reading and Talking Bilingually," *American Journal of Psychology,* 79 (1966), 357-376.
5. Kolers, P. A. "Three Stages of Reading," in H. Levin and J. Williams (Eds.) *Basic Studies on Reading.* New York: Harper and Row (in press).
6. Llewellyn-Thomas, E. "Eye Movements in Speed Reading," *Speed Reading: Practices and Procedures,* 10. Newark, Del.: Reading Study Center, University of Delaware, 1962.
7. Taylor, E. A. "The Spans: Perception, Apprehension, and Recognition," *American Journal of Ophthalmology,* 44 (1957), 501-507.
8. Woodworth, R. S. *Experimental Psychology.* New York: Henry Holt, 1938.

This work was supported principally by the National Institutes of Health (Grant 1 PO1 GM-14940-01 and Grant 1 PO1 GM-15006-01) and in part by the Joint Services Electronics Program (Contract DA 28-043-AMC-02536 [E]).

Some Thoughts on Spelling

MORRIS HALLE
Massachusetts Institute of Technology

The question that concerns me here is "What are the formal properties of an optimal writing system for a given language?" It will be assumed that the optimal orthography of a language is the one that is most readily learned and once learned is utilized with the fewest errors by normal subjects.

The term *orthography* will be restricted to writing systems that represent utterances directly, and excluded specifically will be writing systems such as those used in mathematics or in chemistry which represent the meaning independently of the utterance. Thus, in chemistry the formula: $NAHCO_3$ stands interchangeably for the utterances "bicarbonate of soda" or "sodium bicarbonate," "soda," "baking soda," "nahcolite," and others. In the writing systems, called "orthographies" here, such interchanges are barred. Different utterances like "bicarbonate of soda" and "sodium bicarbonate" must be represented by different sequences of symbols. Moreover, it will also be required of orthographies that they represent utterances as sequences of words, so that in an orthography the word must be a specially coded unit in the transcription. It is obvious that this requirement will exclude chemical or mathematical formulae. I will not require, on the other hand, that orthographies represent sounds directly. Thus, various types of logographic systems, such as the Egyptian hieroglyphs or the Chinese characters, would be included as would also various types of commercial codes, where the user is supplied with a list of words and their code equivalents, which are arbitrary letter sequences.

It is an interesting fact that the Chinese writing system is formally quite similar to these commercial codes used in telegraphic transmission. Whereas in the case of the commercial code a word is represented by an arbitrary sequence of letters, in the Chinese writing system each word is represented by a *character,* which is nothing but an assembly of strokes that have to be written in a particular order. The alphabet of strokes is quite limited. There are only about thirty distinct strokes; and while their disposition on paper with respect to the other strokes of the character as

well as their size is governed by strict rules, these rules provide no information as far as distinguishing one character from another is concerned. Once the sequence of strokes is stated, the character is unambiguously defined. This idea of characters as assemblies of strokes has been utilized in designing a Chinese linotype machine.

This type of writing system has been discussed here because it brings out rather clearly one of the problems that an optimal orthography must solve. In order to transcribe a Chinese word, the writer must remember the character; i.e., the sequence of strokes that represents the word in question. Since the strokes are arbitrary symbols, the writer's or reader's task is equivalent to that of a person trying to remember telephone numbers. And since in order to read a newspaper one needs to be able to read several thousand words, the person who wishes to read a Chinese newspaper must have memorized several thousand arbitrary stroke sequences. This task is roughly equivalent to memorizing several thousand telephone numbers, something that is far from easy and in the case of writing and reading, also quite unnecessary.

The reason that this burden on the memory is quite unnecessary is that instead of representing words by arbitrary symbol sequences, it is possible to represent words with the help of symbols that are related in specific ways to the sounds that compose the word. This is the idea underlying alphabetic and syllabic writing systems, and it capitalizes on the fact that knowing a word usually means knowing its pronunciation as well as its meaning. Hence, if one wants to write a word, instead of writing down some arbitrary sequence of strokes which have to be memorized, one writes down the sounds that compose the word (or rather its *signals*) which need not be memorized, especially as they are already known. Thus alphabetic writing may be likened to a telephone system where to dial a person one need only dial his name. Clearly, in such a system there is no need for phone books or for memorizing telephone numbers, since a person's name is his number. And alphabetic orthographies are superior to logographic orthographies precisely because they obviate the need for memorizing phone numbers, as it were.

It is necessary to note at the outset that in alphabetic orthographies the letters do not represent the sounds made directly. Rather, they abstract from the sounds made certain properties and represent these alone, while omitting quite a number of other properties that are present in the sound. Thus, for instance, the sounds represented by the letter *l* in the utterances *my light* and *mile average* or those represented by the letter *k* in the utterances *nice keys* and *my skis* are quite different, as anyone can easily convince himself. However, these differences are not taken into account in the orthography for the good reason that normally fluent speakers of English are not aware of these differences. These differences are due to the fact that English speakers happen to pronounce the sounds *l* and *k*

differently at the beginning of the word than elsewhere. Since they always do it, there is no need to be particularly conscious of the fact; it is just the way things are done, and one does not become aware of it until some foreigner fails to make this subtle phonetic distinction and pronounces *light* with the same *l* as in *mile*, or vice versa. It is obvious that a practical orthography has nothing to gain from taking account of differences of this sort; if it did, it would deviate from optimality since it would be harder to master than an orthography that disregarded these distinctions.

It is, therefore, necessary to make rather explicit what the nature of these distinctions is. I have noted above that English speakers pronounce *l* in a way different at the beginning of the word from the way they pronounce it at the end of the word. This means that English speakers have some notion as to how the sound *l* is normally to be pronounced; i.e., where one must place the tip of the tongue, how the margins of the tongue are to be shaped, what position is to be occupied by the body of the tongue, how high the velum is to be raised, etc. Assume that the normal *l* is that found in word initial position. It is then necessary to assume further that part of an English speaker's knowledge of his language is that in word final position the instructions for making *l* are changed; namely, the body of the tongue must be drawn back towards the soft palate (or velum). If one thinks of each letter as standing for the appropriate set of instructions to the vocal tract which, if followed, will yield the normal pronunciation of that sound, then one must also suppose that there are additional instructions like the one just discussed, which one might express slightly more formally with the help of a rule such as (1):

(1) /l/ → [+ back] in word final position

and similarly for the /k/:

(2) /k/ → [+ aspirated] before stressed vowel not after /s/.

Since rules (1) and (2) are part and parcel of English speakers' knowledge of their language, there is not much point in taking account of their consequences directly in the orthography, by introducing additional letters such as $\tilde{l}$ and $\tilde{k}$, for example. It is a fact that all languages have phonological rules of the kind exemplified by (1) and (2), and it may appear, therefore, that one might require that:

(3) Orthographies must contain no symbols that reflect the operation of phonological rules.

Whether this principle (3) actually provides one with optimal orthographies is far from obvious. It is, therefore, necessary to investigate in some detail the implications of the principle.

Rules (1) and (2) were characterized by the fact that the new sounds created by them are not otherwise found in English; i.e., rules (1) and (2) are the sole source of these sounds in the language. This is, however, not the only consequence of the operation of phonological rules;

it is quite common for rules to transform one existing sound into another. In English the sound /s/ is distinguished from /z/ as seen from these examples:

(4)

seal	zeal	searing	zero
soon	zoom	said	zed
sole	zone		

English, moreover, is subject to a rule that turns /s/ into /z/ in position between vowels; e.g.,

(5)

sign	consign	design
serve	conserver	preserve
-sist	persist	resist
-sort	consort	resort
-sult	insult	result

/s/ → [+ voiced] (i.e., /z/) /V—V.

To briefly digress here, note that a word like *conserve* is made up of the two subordinate elements *con* and *serve*. Such units are called *morphemes* by linguists. One finds that some morphemes function as words all by themselves. There are others, however, that do not function so. Thus, for instance, the morpheme *serve* functions both as a word and as a constituent of a word, whereas the morpheme *sist* of *resist* and *consist* functions only as a constituent of a word. Rule (5), therefore, says that the same morpheme will appear in two shapes, one beginning with /s/ and the other beginning with /z/. One is thus led to the conclusion that although *seal* and *zeal* are distinct morphemes in English, /sayn/ and /zayn/ (as in *consign* and *resign*, respectively,) are not distinct morphemes.

These facts are of obvious interest to the designer of an orthography. It is clear that *seal* and *zeal* must be distinguished in the orthography; should /sayn/ and /zayn/ be similarly distinguished? If one adopts the principle that phonetic features provided by phonological rules are not to be reflected in the orthography, then one must spell both /sayn/ and /zayn/ with *s*.

One must now ask whether this is the correct decision in the sense that an orthography which spells *s* in both words will be more readily mastered than an orthography which spells *s* in *consign* and *z* in *design*. This is clearly an empirical question, for which, unfortunately, one possesses no relevant experimental data. It is not known whether principle (3) is valid or whether it should be modified. Since it is difficult to have a clear picture of the factors that might have bearing on this question, I examine below a number of additional cases where the same or a similar problem arises. It is hoped that these examples will suggest ideas on what type of experiment would most readily shed light on this question.

Like the sound /z/, the sound /s/ is, under certain conditions, the outcome of the operation of rules like the one just discussed. Unlike the

case just discussed, these derivative /s/ pose rather complex problems for a rational orthography.

The most obvious source of derivative /s/ is the sequence /ss/. Thus, for instance, the prefix *dis* as in *disturb* (cf. *perturb*) or *discover* (cf. *recover*) may also appear with verbs beginning with /s/. Recall that rule (5) applies only to a single /s/; hence, those double /ss/ are not voiced:

(6) discover (recover) disturb (perturb)
dissent resent dissemble resemble

Except for not being subject to rule (5), the double /ss/ in *dissent* or *dissemble* is pronounced exactly like the single /s/ in such words as *sent* or *semblance* and is differentiated from such double /ss/ sequences as "the le*ss* *s*aid" or "mi*ss*pent." The language has therefore the rule:

(7) /ss/ → /s/ within simple words.

Observe that in this case traditional orthography conforms to principle (3) and takes no special account of the simplification of double /ss/ sequences. The orthography postulates that *dissent, dissemble,* and hosts of other words are spelled with double *s*.

A totally different source of derivative /s/ sounds is the /k/ sound, which in position before /i/ is replaced by /s/.

(8) electric electricity
vocal vociferous
medical medicine
k → s / _____ i except in certain morphemes.

This rule, however, does not apply to all morphemes of the language—e.g., *kill, king,* etc.—but only to the so-called Romance part of the vocabulary. To reflect this fact in the orthography, the letters *c* or *k* are used, with *k* representing those /k/ sounds that are exceptions to rule (8), and *c* representing the /k/ sounds elsewhere. Note that since *k* is basically an exception marker, its appearance before vowels other than *i* or *e* strikes the English reader as quite strange. Thus words such as *koala, kangaroo* (or *kola, kool, korn,* those horrors favored by admen) present a strange appearance orthographically.

Incidentally the letter *c* has yet a further function in the orthography. It indicates that the /s/ sounds deriving from /k/ differ from primary /s/ sounds in that they are not subject to the voicing rule (5). Thus, one obtains

(9) conceive deceive (cf. conserve deserve)
concede recede (cf. consent resent)

This fact is quite elegantly accounted for by using the letter *c*. In its utilization of the letter *c*, English spelling conforms to principle (3). The same letter *c* represents the sounds /k/ and /s/ since the change of /k/ to /s/ is the result of phonological rules and according to principle (3) would not be reflected in the orthography.

Principle (3) assures that each morpheme will have only a single spelling regardless of how many distinct pronunciations the morpheme may have in different contexts. However, this fact need not be of great value to the user of the orthography, who quite conceivably might find it easier to master the orthographies where sounds determine much more directly the spelling of particular morphemes in particular contexts. A difficulty that is inherent in utilizing an orthography that is subject to principle (3) is illustrated by the morpheme *cert* as in *concert.* This morpheme appears only in this word; hence there is no way to tell whether it should be spelled with *c* or with *s.* Whatever decision the designers of the orthography make, it cannot fail to be arbitrary and consequently would have to be memorized by the user of the orthography. (There is the possibility of freely allowing alternative spelling for some words, but as this possibility has not been seriously considered by those who devise orthographies, it shall not be discussed here.) It is necessary to inquire whether difficulties of the sort just outlined, which stem directly from the attempt to conform the principle (3), are more serious than the inconvenience that would result if principle (3) were abandoned. The next example might shed some light on this point.

A third source of derivative /s/ is /t/, as seen from such examples as

(10)		
	democrat	democracy
	diplomat	diplomacy
	hypocrite	hypocrisy
	transparent	transparency
	illiterate	illiteracy
	idiot	idiocy

English is also subject to the rule that

(11) t → x / ——— + i only before certain affixes.

The + in the rule is supposed to indicate that the spirantization takes place only if the /i/ belongs to a distinct morpheme. No spirantization takes place before *i* of the same morpheme as shown:

(12)				
	patio	Antioch	Pontiac	piteous
	loyal+ty		special+ty	divin+i+ty

Moreover, rule (11) does not apply before affixes such as *ing* in *acting;* the adjective forming affix *y* as in *witty;* nor the affix *ity* as in *chastity, identity.* Before these neutral affixes, rule (8) does not apply either; cf., *taking, lucky.*

Rule (11) raises problems for the orthography that are quite similar to those raised by rule (8). It is possible to introduce a hyphen in the orthography and thus distinguish those words where /t/ → /s/, e.g., *idiot+y,* from those where /t/ remains unchanged, e.g., *loyal+ty.* For some reason the designers of English spelling did not use this device. Instead they chose to represent those derivative /s/ with the letter *c,* thereby violating principle (3). The advantage of this symbolization is

that like the /ʒ/ deriving from /k/, the /s/ deriving from /t/ is not subject to the intervocalic voicing rule (5). Whether those theoretically quite different decisions concerning the orthography have consequences insofar as the ease with which the respective spellings are mastered is not known to me, and I would be unable to guess at the results.

The final rule to be considered here is the rule that turns /s/ → /š/. Examples of this rule are

(13) suppress suppression transgress transgression
confess confession

Like rule (12), this rule requires that a morpheme boundary intervene between the /s/ and the following vowel. When there is no boundary, the process does not take place:

(14) potassium intelligentsia

The rule must, therefore, read

(15) /s/ → /š/ / _____ + i V where V stands for a vowel and where certain other phonetic conditions have to be met.

As the rule is stated here the examples in (13) are not fully accounted for. In the pronunciation of words such as *suppression* there is no trace of an /i/ following the /s/ sound. That the *ion* suffix has an /i/ actually present can be seen from such examples as *oblivion, lampion,* and *criterion.* We shall, therefore, assume that after /š/ the /i/ is deleted by a special rule which, incidentally, does not apply generally but only if certain accentual conditions are met. As a result, pairs such as these are obtained:

(16) partial partiality initial initiate

As already anticipated in the example in (16), rule (15) applies to all /s/, regardless of their source. It differs thus from rule (5) which, as will be recalled, applied only to primary /s/ but did not affect the derivative /s/ resulting from the operation of rules (8) and (11). The general applicability of rule (15) is shown by examples such as

(17)

electrician	partial
artificial (cf. artifact)	presidential
crucial (cf. crux)	prohibition
suspicious (suspect)	permission
optician	potentiality

Thus again one has a case where a given sound has a multiplicity of sources and where, therefore, the designer of the orthography is faced with a problem of particular difficulty. In the case of derivative /s/, English orthography again conforms basically to principle (3) and, as a result, the sound /š/ is represented as *ss, t,* and *c.* On first sight it might appear that this lack of uniformity in the application or nonapplication of principle (3) is the cause for the well-known difficulty of English orthography. I think, however, that this may well be a hasty conclusion and that there may be interesting limitations on the validity of principle (3).

It seems plausible that in cases such as those created by rule (8), where the appearance of one or another variant of the morpheme is determined entirely by adjacent sounds or word boundaries, a better orthography would result if principle (3) were maintained than if it were violated. Also in cases of this sort the relationship between the primary and the derived forms is so obvious to the naive native speaker that any violation of principle (3) is quite unintuitive. Thus, it would seem that it would increase the difficulty of the German orthography if the present tense paradigm of a verb, such as *loben,* were spelled in conformity with the pronunciation but in violation of principle (3) as shown below:

(18)

ich lob-e	wir lob-en
du lop-st	ihr lop-t
er lop-t	sie lob-en

On the other hand, where the operation of a rule is determined by boundaries other than word boundary or where the conditioning context cannot be read off directly from the orthographic representation, it would appear that violations of principle (3) result in a more optimal, rather than less optimal, orthography. Thus, for example, I think that umlauted vowels in such German adjectives as *mündlich* (cf. *Mund*), *rötlich* (cf. *rot*), *männlich* (cf. *Mann*) should probably be indicated in the orthography by special symbols even though this procedure violates principle (3).

Needless to say, these are speculations based on nothing more solid than some unsystematic observations on the problems that different orthographies seem to pose for their users. It would be interesting to know to what extent these guesses are correct. But this information will come only from experimental studies with different types of orthographies. If this discussion ultimately leads to experimental studies along the lines sketched, its main purpose will have been fully accomplished.

Words and Morphemes in Reading

KENNETH S. GOODMAN
Wayne State University

As written language developed and the alphabetic principle evolved, graphic displays shifted from direct representation of meaning to representation of oral language. Letter sequences were designed to represent sound sequences. Much later, the device of using extra space at appropriate intervals in written language to create segmental units was introduced, and the already existent term *word* was applied to these units (*5*). Like spelling patterns, word boundaries stabilized and conventions grew up which were, in fact, much more resistent to change than comparable phenomena in oral language. As language analysis developed, particularly in the form of dictionary making, written language and not oral language became its vehicle. The word was indeed a useful unit. Its range of meanings could be recorded; its grammatical functions listed; and its relationships to other words induced. Just as spelling was intended to reflect phonology, so written words were intended to correspond to actual segments of speech (even the term "parts of speech" suggests this). But initial inadequacies in understanding and transcribing the segmental units of oral language created a gap. As the word concept in written language codified and oral language continued to change, the lack of fit between oral and written language on this segmental level widened.

When linguists began to study segmental units of speech, they found the need for a new term, *morpheme*, to describe these units. Words, those conventional units of written language separated by white space, do not really exist in speech. The word has become a unit of written language.

All this of course would be of only academic interest, if it were not that much of the research on language and the teaching of language have been based on the assumption that words are natural units of language and that words in print correspond to words in speech. In reading in particular, the focus on words has grown in great part from

the mistaken assumption that they are the gestalts of language. Thus, when Gray and others recognized that reading instruction had to deal with something more than matching letters and sounds, they moved to word focus. They took for granted that words were perceptible units even to beginning readers. Reading came to be closely tied to the acquisition of an expanding sight vocabulary, a repertoire of learned wholes. Though this summary is an oversimplification of what its detractors called the *look-say* approach to reading, the best proof of how word centered it was is in the evidence from research: in reading tests based on this approach, simple word-recognition tests correlate quite highly with total scores. Such correlations have been interpreted as proving the validity of word-recognition focus in reading instruction; but on the contrary, all that they prove is that children tend to learn what they are taught. Ironically, if one tests the ability to recognize words as evidenced by one's ability to match their printed form with an oral equivalent, children given phonics training tend to do somewhat better than their sight-word peers in the stages when the repertoires of the latter group are limited. Chall and others have taken this matter as evidence that phonics, as such, is a necessary foundation for early reading instruction. If one could equate language with words and reading were only a matter of finding the oral equivalent for the written form, then perhaps this conclusion would be true. The question would be simply whether to use a method in which words were taught and the phonic relationships induced or discovered by the learners (word centered) or a method in which phonic relationships were taught and words were acquired through phonic attacks (phonics centered). In her recent comparison of studies of reading methods Chall used seven basic criteria (*2*). Four of them involved word recognition in some sense: one is letter-sound correspondences, one involved speed, and only one involved comprehension. The obvious focus was on the word as an end in itself. Thus "the great debate" is caught within the confines of the word. If one could clarify the relationships of words to written language and to comparable (but not corresponding) units of oral language, one might not only shed light on the phonics-word controversy but perhaps demonstrate that the debate is quite obsolete—a relic of the history of reading instruction.

Modern insight into the relationships between oral and written English on the letter-sound level has already shown that these relationships are much more complex than letters having sounds, letters representing sounds, or phonemes corresponding to graphemes. This complexity is not simply a case of regularities and irregularities as has been commonly assumed even by many linguists who have turned their attention to reading. What appears as irregularity to the casual observer results actually from the different ways that phonemes (oral symbols) relate to oral language and graphemes (written symbols) relate to

written langauge. As Venezky has indicated, one finds regularity if symbols are treated as part of separate systems, each with a set of rules governing their patterning (*8*). The relationships are between these patterned systems rather than between the unitary symbols themselves. Thus the common sound in *church, situation,* and *watch* is irregularly represented if one unit of speech is matched to one of writing; but it is quite regularly represented if patterns are matched with patterns. Phonics, then, must be more broadly redefined if it is to have any meaning at all. One must see it as the complex set of relationships between the phonological system of oral language and the graphic system of written language. Such a definition will also help show that variations in the phonological system among dialects of English are accompanied by variations in the phonics relationships since the graphic system tends to be stable across dialects.

Words and morphemes must be viewed also as segmental units which relate through rules to the patterned systems of which they are a part. Both words and morphemes tend to acquire in one's mind a reality they do not quite deserve because of their apparent stability in a variety of linguistic settings. Instead of regarding them as useful constructs for dividing longer units of language (sentences, utterances, sequences of discourse) into segmental units, one begins to regard the longer units as accumulations of words or morphemes.

In actuality, of course, these molecular segments have no existence apart from language structures. What is called their meaning is in reality the portion of the meaning of a larger unit that may be assigned to one segment. What is written in dictionaries is the range of possible meanings assignable to a given word in the sentences in which it may occur. As many entries for a word are made in the dictionary as there are ranges of meaning for the word. The meaning of a sentence depends on the words or morphemes that compose it, but it is always more than the sum of their meanings. Similarly, one may speak of the grammatical functions of words or morphemes, but these are only the portions of the syntax of a sentence assignable to the segmental unit.

In Chomsky's view, the syntactic component of language begins with a base consisting of context free rules which function "to define a certain system of grammatical relations that determine semantic interpretation and to specify an abstract underlying order of elements that makes possible the functioning of the transformational rules" (*3*).

The end of the generative process results in choice of specific forms of specific morphemes in specific sequences that fulfill the grammer-meaning-phonology constraints that have been imposed by the rules.

Here is a simple discourse that illustrates how this works:

Mother: Mary, will you ask Jimmy to hang up his jacket?
Mary: Hey Jim, hang your stuff up.
Jim: I did.

Here each speaker is conveying essentially the same information concerning the hanging up of the jacket. The situation in which the discourse is occurring and its sequence evoke a set of rules that result in varying actual utterances. Jim, in fact, need only use a pronoun and a pro-verb to represent the entire sequence: Jim hung up his jacket. He was able to communicate his response effectively without resorting to meaningful terms. Literally he cites an underlying grammatical pattern in the semantic context of discourse. Alternate responses could have been similarly communicated: *Yes, I will; No, I won't*; *I don't have to* (pronounced *hafta*). The latter could elicit the following repartee:

Mary: You got to (gotta).
Jim: I don't either.
Mary: You do, too.
Jim: Why?
Mary: Mom said so.

Only in the last does one get any new meaningful element and, even there, *so* represents *that James should hang up his jacket.*

It would serve no useful function to describe in detail the sequence of rules required to produce these utterances. The important point is that language—not words or morphemes—in its ordered flow is the medium of communication.

In receptive phases of language, reading, and listening, one works backward from the surface structure, first deriving the rules and subsequently, the deep structure. But one cannot and does not treat words in print or morphemes in speech as independent entities. One must discover the grammatical relations in order to determine the semantic interpretation.

Educated, literate speakers of language have learned to think of words as self-evident entities and to impose the characteristics of written words on oral language. Their perception of language is influenced, but this supposition should not be confused with reality.

The remainder of this paper will explore morphemes and words as segmental units, the lack of one-to-one correspondence between them, and the implications for reading instruction.

Morphemes, Oral Language Molecules

Like the molecule, the morpheme is the smallest segment which has all the basic characteristics of the larger system. The morpheme's capability of carrying syntactic and/or semantic information distinguishes it from smaller segmental units, phonemes, that must be integrated into morphemes before they can really be considered linguistic units (actually a few morphemes are only one phoneme long).

It is useful to treat morphemes as being divided into two classes, free and bound. Free morphemes occur in a variety of settings with relative freedom from accompaniment of other specific morphemes. Bound morphemes occur in more limited settings and always in precise relationship to another relatively limited set of morphemes, usually free morphemes.

In *walked, walk* is a free morpheme and *ed* is a bound morpheme, one of a small number of bound morphemes in English that carry primarily grammatical information. The bound morpheme *ed* always occurs as a suffix of certain verbs. It has three basic variants (allomorphs); they occur in complementary distribution with the choice made on phonological grounds; the final consonant in the base determines the particular allomorph. This type of inflectional suffix is a remnant of what was once a more general aspect of English grammer.

Other bound morphemes serve derivational functions and carry more semantic information. The *er* in *worker* makes a noun of the verb *work* and adds the *someone who* meaning. Other bound morphemes take the form of semantic prefixes. The problem with these is that they range from old, dead Latin bound morphemes to current, more-active ones. The dead forms have lost their ability to combine freely with all appropriate morphemes. In a sense, they have lost their separateness. In verb formations, English speakers seem to prefer to use common verbs with particles to produce discontinuous verbs rather than to use older forms with prefixes. One does not *dissect*; one *cuts up*. One would rather *eat up* than *consume* It's easier to *tear down* than *demolish*. Or at least it seems easier because this verb-particle system is a live one that can be used flexibly to handle meanings. There is even a trend toward redundancy in English, that of supplying another carrier of the same meaning as the prefix. Thus, one says *combine with, reflect back, attach to, enter into, descend from, eject from, provide for, submerge under*. The bases to which prefixes attach are frequently not free English morphemes but old Latin ones which only occur in such combinations and hence must be regarded as bound morphemes themselves. In a sequence, like *combinations* one can find five morphemes but no free morphemes.

The degree that particular bound morphemes will be apparent segmental units to any given speaker of the language and the degree that he will be able to separate a given bound morpheme from a base form are variable. Most speakers treat such words as *descend* as single units.

Intonation, particularly relative stress, is very much involved in relating morphemes and influences some phonological options. Verb-noun pairs such as *produce/próduce, contract/cóntract, record/récord* are examples of how the relationship between morphemes produced by intonation affects meaning. In the sentence "All blackboards aren't black

boards," one can distinguish, by the relative stress, boards that are black from those that are for use with chalk. The closer relationship between the two morphemes in *blackboard* than in *black board* results in what one has called compounds (two free morphemes united). And, of course, that relationship is represented in print by an absence of white space or a hyphen in place of the white space. But neither device consistently represents this compounding. *Blood test* is a compound, but it is not joined when used as a noun (He took a blood test) and hyphenated when used as a verb (We blood-tested our chicks). Consider *eye doctor, eyebrow, eyelid, eye-catching.* All have the stress pattern of compounds. The conventions of print do not directly correspond to the intonational devices of oral language.

One phase of intonation used to relate morphemes more or less closely is juncture; the length of pause between morphemes can be varied. *Nitrate* has a different kind of juncture than *night rate.* However, these junctures are only relatively different, and in the flow of speech it is often quite difficult to discern any difference. A speaker can, of course, intentionally exaggerate the juncture to be sure ambiguity is avoided. But is a certain tooth paste *proved effective* or *proved defective?*

What further complicates things is that morphophonemic rules cut across morpheme boundaries in the flow of speech. The same rule that operates in *situation* applies to *can't you* (cancha). We find *education* and *don't you* (doncha). Certain sequences involving these morphophonemic rules are so common that their constituents apparently are not distinguished by young speakers. *Have to* (hafta), *going to* (gonna), *with them* (with'm), *with him* (with'm), *must have* (must'v), *should have* (should'v) are examples. Only the meager set of contractions recognized in print represent this phenomenon, and even those are avoided in some situations. In contractions, one unit in speech is represented by two in print. The resulting problems affect both reading and spelling. The problem does not confine itself to children. Adults often have difficulty distinguishing segmental units in idiomatic or archaic expressions. Recently an undergraduate used this spelling in a paper: *anotherwards* (in other words). Teachers are quite familiar with what happens when children are asked to write the pledge to the flag or the national anthem. The writer must confess for many years he was saying *in the visible* (indivisable).

Jones has indicated that the difficulty in determining junctures is not confined to the uninitiated. Phoneticians employed in her research study frequently could not find expected differences in pause length. Prepositions and articles, on the basis of their limited privilege of occurrence and the junctures which separated them from the next morpheme, behaved very much like prefixes (6).

Any one can confirm the difficulty of using purely intonational cues in segmenting the flow of speech into free and bound morphemes

by listening to a brief statement in an unfamiliar language and trying to guess how many units are heard by a speaker of the language.

Native speakers do, of course, bring their user's knowledge of the language to bear on the same task. Stable units are perceived by them as segments of wholes.

Recent research on child language development has demonstrated that children at early ages do produce language that can be segmented into morphemes (*7*). Berko has also demonstrated that children have mastered rules relating to inflectional suffixes, as demonstrated by their ability to produce the expected allomorph for nonsense bases she supplied (*1*). It is obvious that parallel to their mastery of grammatical and phonological rules, children are also acquiring a sense of language units. Parents are well aware of a stage when children, selecting a unit from language they have heard, begin to ask such questions as "What does ———— mean?" Some of the funny-sounding language children produce consists of unsuccessful efforts at interchanging units that are assumed to be equivalent by the child. It must be reiterated, however, that children speak in language, not words, and that the sense of morphemes does not precede their use of sentences. The whole is not a combining of parts; the part is differentiated out of the whole.

Words, Written Language Molecules

Words, unlike morphemes, are very easy to identify as units. One can pick up a page, written in an unfamiliar language that employs words as graphic units, and easily count the number of words. In producing written language, identifying word units creates a more difficult problem; ultimately the producer of written language must remember what is and what is not a word.

To the literate, words are familiar units in language sequences and in nonlinguistic settings. Words occur in lists and dictionaries, in fact, anywhere that one chooses to put them. Of course, one can recite a list of morphemes, too. But that is not very common. Again the trouble is that words are not the real entities that they appear to be. They retain their physical appearance in isolation, but they lose much of their semantic and syntactic quality as language units. A list of five words is not at all comparable to a five-word sentence. This confusion of words as entities and as units of written language has been evident in a great deal of reading research and practice. It has also been evident in much of the research on so-called verbal learning. Sometimes such research has even dealt with lists of word-like nonsense, assuming that the ability to deal with such nonsense could be directly interpreted as language ability. (The pun is intended.)

One-to-One Relationships

In the previous sections, some aspects of the lack of correspondence between words and morphemes have been pointed out. Problems

with compounds, affixes, and intonation were discussed. The illusion of a one-to-one correspondence between oral language units and written language units appears to stem from the treatment of words as entities. The oral name for the written word (in isolation from language) is assumed to be a unit of oral language.

In a sentence such as the following, this illusion of one-to-one correspondence is illustrated: *I'm going to have to find a way to get away tomorrow*. One word *away* and two words *a way* sound very much the same. Morphophonemic rules cut across morpheme boundries in *going to, have to,* and *to get*. The literate reader is not bothered by this lack of close correspondence; in fact, he will, in general, not be aware of it. For him the illusion is complete; he thinks that he reads every word, one at a time.

But for one learning to read, this lack of correspondence will cause problems. If he matches oral names with graphic word shapes, he becomes a word caller and may lose the meaning. He is dealing with print arranged in words, but he must make his associations on higher language levels if he is to comprehend.

Words in Reading

It is no great revelation to first grade teachers that children frequently do not have any idea what words are. Perhaps what has been said here will begin to explain why they do not. The inplications of this understanding should lead in two directions: 1) less word-centeredness in reading materials and instruction and 2) more careful development of word sense in beginners where it is necessary and possible.

Several simple steps can help to move the teaching of reading away from word focus. Essentially they involve shifting focus to comprehension; the goal of reading instruction becomes more effective reading for more complete comprehension. Instead of word attack skills, sight vocabularies, and word perception, the program must be designed to build comprehension strategies. The presentation of words in isolation should be avoided wherever possible. Words are harder to read in isolation than in context, and the isolation of words makes them ends in themselves (*4*). Children learning to read should see words always as units of larger, meaningful units. In that way they can use the correspondences between oral and written English within the semantic and syntactic contexts. As children induce these correspondences, they will develop the strategies for using them in actual reading. They will be spared the need for transferring the correspondences from nonreading to reading.

As proficiency develops in reading, silent reading should predominate so that written language will become parallel to oral language; the child will then learn to go from print directly to meaning with no need to resort to oral language.

The development of word sense is something which must be nurtured as reading progresses. Children will differentiate words from graphic language wholes just as they have learned to differentiate morphemes in oral language. First, a learner knows a graphic sentence; then, he knows familiar words in new sentences; finally, he knows words anywhere, including lists. Teachers can assist children by helping them to see phrases as subdivisions of sentences and words as recurrent elements within them.

Word meanings are also differentiated out of varied contexts. As the reader meets a word in various sentences, he begins to form an idea of the part of the meaning assignable to that word. He then tests his definition in subsequent encounters. A dictionary can confirm his definition or sharpen it, but it cannot supply a definition.

Conclusion

There will always be some problems in learning to read that result from the lack of close correspondence between the units of oral and written language. Instruction based on an understanding of language and language units can help to minimize these problems.

REFERENCES

1. Berko, Jean. "The Child's Learning of English Morphology," *Word*, 14 (1958), 150-177.
2. Chall, Jeanne. *Learning to Read: The Great Debate*. New York: McGraw-Hill, 1967.
3. Chomsky, Noam. *Aspects of the Theory of Syntax*. Cambridge: MIT Press, 1965, 141.
4. Goodman, Kenneth S. "A Linguistic Study of Cues and Miscues in Reading," *Elementary English* (Oct. 1965), 639-643.
5. Huey, E. B. *The Psychology and Pedagogy of Reading*. Macmillan, 1908, reprinted Cambridge: MIT Press, 1968. (Use of white space to separate words did not become general until about the 11th century.)
6. Jones, Margaret Hubbard. "Some Thoughts on Perceptual Units in Language Processing," in Goodman (Ed.), *The Psycholinguistic Nature of the Reading Process*, Wayne State University Press (1968), 41-58.
7. McNeil, David. "Developmental Psycholinguistics," in Smith and Miller (Eds.), *The Genesis of Language*, MIT Press, 1966.
8. Venezky, Richard. "English Orthography: Its Graphical Structure and Its Relation to Sound," *Reading Research Quarterly*, No. 3, Vol. 2.

Some Language and Cultural Differences in a Theory of Reading

ROGER W. SHUY
Center for Applied Linguistics

Two basic areas in which linguistic research can help children with reading disabilities caused by behavioral mismatch with language phenomena as the focal point will be outlined in this paper. Of the many areas of behavioral mismatch of materials to the child's culture, this study will focus on two quite different dimensions, one having to do with his cultural environment and the other dealing with the way he proceeds to learn language symbolization. The former might be called *positional;* the latter, *processive.*

Morton Wiener and Ward Cromer (*5*), in their article, "Reading and Reading Difficulty: A Conceptual Analysis," describe four different assumptions which are used to explain what is meant by the term "reading difficulty." Each assumption implies a kind of built-in model of remediation. Some researchers, for example, assume that reading difficulty involves a kind of malfunction, usually of the sensory-physiological type. Other investigators feel that "reading difficulty" involves a deficiency of some sort which must be supplied before adequate reading can take place. Still others attribute "reading difficulty" to certain things (bad method, anxiety, etc.) which are present but interfering and which must be removed before good reading can take place. A fourth approach to "reading difficulty" is one in which the researchers assume that the child would read adequately if the material and method were consistent with his behavior patterns. They believe that the reader having difficulty is not necessarily defective physiologically. He does not lack something and he has no particular outside disruptive interference. His cultural operative system is simply different from that of the reading instruction. Investigators who work under this assumption believe that in order to make the child read, either the material or the behavior pattern must be changed.

The abysmally slow process in the cross fertilization of the disciplines which are legitimately involved in the teaching of reading is a case in point. For several years now, it has been rightly assumed that linguistics has a major contribution to make to reading research. However, several situations have militated against such cross fertilization. For one thing, linguists are few in number and confronted with thousands of tasks. It is seldom difficult, for example, for a graduate student in linguistics to find a thesis topic. There are any number of things to do in linguistic theory and grammer writing, to say nothing of the many hyphenated disciplines, such as psycholinguistics and sociolinguistics, which have made recent though impressive appearances. With all of this theoretical, descriptive, and relational work to do, applied linguistics does not hold high priority for the current generation of linguists. If the reason for this were simply that sound applications cannot be made until more adequate theory and descriptions are available, there would be little to complain about. There is some reason to suspect, however, that the failure of linguists to concern themselves about the various implications of their discipline to pedagogy stems partly from the kind of academic snobbery that is predictable when a discipline is in the catbird seat. But for whatever reason, the application of linguistic knowledge to reading and language arts has been something less than satisfactory. A willing but linguistically unsophisticated educator is frequently at a loss to learn enough linguistics to help him with his tasks because the style of thinking and writing in linguistics is as in-group oriented as any field in the curriculum. An educator who reads a linguistics textbook will probably have to slow down considerably and, even then, he will make errors and comprehend less than linguists.

Consider the educator's "reading difficulty" for a moment in light of the Wiener-Cromer taxonomy of research assumptions. One would be hard pressed to show that educators have sensory or physiological defects. They do not lack some function necessary to the reading process. Nor can one casually observe that an entire discipline is made up of scholars who have intrapsychic conflicts. Their reading difficulty seems, rather, to stem from a cultural difference characterized by a different view of life's problems, a different style of self-presentation, and a different orientation to the written page.

The educator's "reading problem" might easily be compared to that of a child from a culture which is in some way alien to the school processes. (It must be realized, however, that the educator's reading problem does not stem from a different grammatical system as does the difficulty of the urban child.) The systematic study of such cultural differences has not yet been completed, but there are several aspects of it which are clear even at this early stage. Two dimensions of the problem have already been labled *positional* and *processive*. There are

undoubtedly many other aspects of the taxonomy and many other examples of their membership. The following are meant to be illustrative rather than exhaustive.

The Positional Dimension

In the past years linguists have been working diligently in different parts of the country to define the exact linguistic features which characterize peoples of different social status. The work of the *Linguistic Atlas of the United States and Canada*, begun in the thirties, made some crude attempts at obtaining socially interesting information along with invaluable data which revealed important historical and geographical insights. The rise of interest in urban problems in the sixties, however, has called for an entirely new strategy. As the interest of linguists shifted from historical and geographical concerns to synchronic social matters, it became increasingly difficult to hang onto older ways of operating. Linguists learned more about sampling design, about data-gathering techniques, about analytical procedures, about mechanical information retrieval, about statistics, and about social stratification. Major linguistic research in urban areas has been conducted recently in New York, Chicago, Detroit, and Washington, D.C. These research projects are just beginning to bear fruit to the educators.

The Sociolinguistics Program of the Center for Applied Linguistics in Washington, D.C., which now houses both the Washington, D.C., and Detroit research projects, will be the source of remarks about cultural position as a feature of reading difficulty.

Many linguists, although by no means in total agreement as to the extent of the cultural contrast or as to its origins, have been describing and analyzing the systematic language differences between social classes in America with a particular focus on urban poor Negroes, Puerto-Ricans, and immigrants from impoverished rural areas. How linguists have chosen to accomplish this focus varies from project to project, but two major contrasts are apparent. One group feels that the proper way to study Negro speech is to study only the speech of urban poor Negroes. In contrast, the other group feels that in order to study Negro speech one must study the speech of Negroes of all social classes as well as Caucasians of all social classes. In doing so, the latter group can be accused of spending undue time and attention on the nontarget audience. In reply, they assert that it is dangerous to talk about the speech of any group without carefully identifying it and without seeing it in relation to other contiguous social groups.

The Sociolinguistics Program at the Center for Applied Linguistics clearly focuses on the urban Negro since research shows this group to be high in the school dropout rate and low in reading proficiency. Current research projects include studies of linguistic correlates of upward mobility among urban Negroes, various studies of social strati-

fication as revealed through grammar and phonology, language attitude studies, linguistic age grading, culture studies, and the preparation of classroom materials which stem from the basic research conducted in the program. Throughout the research, however, it should be clear that one is not dealing with sensory-physiological defects or disruptive psychological conflicts.

Nor is one involved in the study of phonetic or grammatical "deficiencies." That is, one is not saying that the child cannot learn to read because he does not know standard English. One is saying, instead, that the linguistic system of the ghetto Negro is different in a number of identifiable features from that of standard English. If a nonstandard dialect is interfering with the acquisition of standard English reading skills, at least two courses are available. One is to adjust the child to suit the materials. Another is to adjust the materials to suit the child. If the end result is successful, the system used is immaterial. Those who advocate teaching the child standard English before he learns to read assume that since it is a good thing to learn standard English, the child might as well learn it before he learns to read. Most linguists, on the other hand, realize that the complexity of language learning is such that this sort of engineering is too slow moving to be effective; that is, the social value of learning standard English is not worth the long delay it would cause in his learning to read. The simple truth is that speaking standard English, however desirable it may be, is not so important as learning to read. It would be extremely difficult, furthermore, to teach standard English to children who have no standard English speaking peers.

In any case, the idea of changing the child to suit the materials seems educationally naive when one stops to give it careful consideration. The usual practice among educators has been to suit the materials to the child. It is hard to imagine how one ever got so sidetracked on this issue. But even assuming that it were desirable to first teach children standard English, no research shows that children have any great conscious awareness of the fine distinctions of the social dimension of language. Of course, they are quite able to use grammatical, phonological, and lexical forms in keeping with their own value systems; but these value systems are those of the unsophisticated child who just may value the speech of a juvenile delinquent, a dope peddler, or an athlete more than the speech of a teacher, an announcer, or a judge. Furthermore, pre-adolescent children are relatively unable to articulate what they are doing when they adopt someone's linguistic norms. They can imitate someone's speech (without a mature value orientation), but they can not explain what it is about the grammar or pronunciation that they are imitating. (Occasionally, however, they can cite lexical matters which they think have social consequence.)

This condition is not surprising since it is also difficult for adults, even language arts teachers, to identify these things. In her doctoral dissertation,

Anne E. Hughes (*1*) asked a random group of urban teachers of disadvantaged preschool children to identify the language problems of their students. The teachers were first asked to talk about the characteristic linguistic problems. Then they were asked to listen to a tape recording of some of these children and identify the linguistic problems on that tape. The results showed a very low correlation of response to reality.

Eighty percent of the teachers observed that their students have a limited vocabulary. One teacher offered the following reason for this "handicap":

> . . . the children came with a very meager vocabulary . : . I think it's because of the background of the home and the lack of books at home, the lack of communication with the family, especially, if there are only one or two children in the family. Perhaps if there are more children in the family communication might be a bit better. They might have a few more words in their vocabulary.

Another teacher observed,

> In the inner-city, the child's vocabulary is very limited. His experiences are very limited.

These comments are typical. Neither teacher gave any indication that the home environment might produce a *different* vocabulary. Both felt, on the contrary, that a lack of school vocabulary was equivalent to a lack of overall vocabulary. This widely held but erroneous concept, in which the disadvantaged child is sometimes called nonverbal, appears to stem from recent research reports on the language of the disadvantaged child. Nothing in the current research of Washington, D.C., or Detroit Negroes supports this idea. The notion that children in disadvantaged homes are the products of language deprivation seems to mean only that the investigators proved to be such a cultural barrier to the interviewee that informants were too frightened and awed to talk freely or that the investigators simply asked the wrong questions.

If the teachers' comments about vocabulary were unsophisticated, their descriptions of their children's pronunciation and grammar were even worse. Thirteen percent of the teachers observed that some students could not talk at all when they came to school; many felt that these children could not hear certain sounds but it is grossly unfair to postulate that because a child does not relate his sound system to printed symbols, he cannot hear these sounds. Yet, such is the state of the profession. One third of the teachers characterized their children's greatest grammatical failure as their inability to speak in sentences or complete thoughts.

This research showed clearly that one of the most important aspects of language development among disadvantaged children centers on imprecise descriptions of the problem, large scale ignorance of how to make such a description, and the interference of pedagogical folklore which passes as knowledge about a vastly neglected and underprivileged group of human beings.

If teachers have such trouble articulating whatever it is they are supposed to be doing about the disadvantaged child's language, how can one expect children consciously to manipulate their language toward an ill-defined standard, especially with an as yet underdeveloped social value system?

The position of a Negro child in an urban ghetto is, then, that he has a functioning language system which does not necessarily match with the language system of the school. This position is further complicated by a conflict between the child's culture and that of the middle class school system. Small boys in primers often have white middle class names like Jim and Chuck whereas the preferred names of urban poor Negroes are James and Charles. Although seemingly a minor matter, if it is important for children to identify with the characters in the primers, one must do more than color half the faces brown. Recent research on this problem has been done by Joan Baratz of the Center for Applied Linguistics, where sentence repetition experiments clearly indicate that middle class white children have as much difficulty repeating syntactical construction commonly used by Washington, D.C., Negro children as the Negro children had in repeating the white middle class syntactical forms. That is, if the systematic syntax of lower class Negro children is used as a measure of middle class white success, the white children will do poorly. The implications of this research point squarely to the fact that there is cultural mismatch between student and teaching materials.

The first major task for linguists is to describe and analyze this language system of the urban ghetto. In many ways it is similar to that of standard English, but in several very important ways it is quite different. It differs basically in two ways: 1) in the presence of some feature not found in standard English or the absence of some feature found in standard English, and 2) in a frequency distribution of a feature which is significantly different from that of standard English.

A quite romantic picture of the differences between standard English and inner-city Negro English would be to say that their grammars and phonological systems are entirely different. Current research in New York, Detroit, and Washington, D.C., has shown this to be a gross overstatement. If it were true, there would be little mutual understanding between speakers of the different dialects. There are significant contrasts, however, particularly evident when comparing the verb systems of lower and working class Negroes with those of middle class Negroes and with whites of all classes. The copula and auxiliary have been the most fruitful areas of study so far, particularly with regard to a feature which is present in one social group while absent in another (*3*). There are many examples of frequency distribution differences between racial and/or social groups (*2*). The most notable of these include recent studies of multiple negation, pronominal apposition, r-deletion, l-deletion, consonant cluster reduction, devoicing of word final, and stop consonants, among others.

The significance of this sort of research for beginning reading instruction is of two kinds, depending on whether the feature is phonological or grammatical.

Phonological features

A careful description of the phonology of disadvantaged classes (in contrast to that of the middle classes) will be of more use to teachers than to writers of classroom materials. The arbitrariness of the symbolization process makes it rather unnecessary to recast primers into graphemic series which delete the *r* in *car* (cah) and the *l* in *help* (hep), which substitute voiceless stops for voiced ones in words like *word* (wort), and which show consonant cluster reductions in words like *just* (jus) and *send* (sen). Urban disadvantaged Negroes should not find it difficult to discover that /jəs/ is realized in print as *just* or that /k^{h}h/ is realized as *car*. Their grapheme to phoneme rule would be <st> → /s/ in final position. This is certainly no more unreasonable than other double grapheme relations as single sounds such as <th> → /o/ in *thin* or <mb> → /m/ in *thumb*. That is, the decoding process of reading is already imbued with such rules. One might also ask, however, how different the problem is for urban poor Negroes than for, say, middle class whites. There is considerable evidence to show that in some oral styles middle class whites also reduce these consonant clusters, although not always so frequently as do Negroes.

In addition to cases in which the reduction of consonant clusters occurs similarly for urban poor Negroes and standard English speakers, there are occasions in which the nonstandard Negro cluster reductions are different, depending on the surrounding sounds, from standard English. For example, if the standard English words ends in /st/ and the following word begins with /s/, the /st/ cluster is frequently reduced to /s/, as in /wesayd/ (west side). However, in nonstandard, the cluster may be reduced whether or not the following word begins with /s/, as in /wes-indiyz/ (West Indies). The teacher will probably not correct the standard English speaking child when he says /wesayd/, but she may well object to the nonstandard speaker's /wesindiyz/.

As for the other phonological features, linguists can make good cases for the systematic nature of the disadvantaged Negro's decoding process. For example, whereas a middle class white or Negro might decode <time> as /taym/, the ghetto Negro might realize it as a front vowel with a different glide segment, /t æ hm/. If the glide vowel is entirely absent (as it often is), the main vowel is usually lengthened (in the sense of duration), thus producing /t æ:m/. The rules for these various realizations may be formulated as follows (The term, *rules,* is not used here in the current sense in which it is found in theoretical linguistics. That is, one is not referring to derivational history. From the linguist's viewpoint, a more accurate term might be *correspondences*):

Standard	Nonstandard
Rule S 1 <t> -> /t/	Rule NS 1 <t> → /t/
S 2 <i . . . e> → /ay/	NS 2 <i . . . e> → /æ:/ ~ /æh/

Thus rules S 1 and NS 1 are identical. Rules S 2 and NS 2 have different correspondent features but the same number of correspondences. That is, <i> followed by a noncontiguous *e* marker yields a glide /ay/ in standard English of the North, whereas here it yields either a different glide, /æ i/, or /æ/ plus a vowel duration which may be said to replace or compensate for the glided vowel.

All of this is meant to indicate that there is nothing irregular about the phoneme-grapheme relationship of speakers of nonstandard. The correspondences are quite similar in quantity but different in certain shapes. In terms of entire linguistic structures, however, these differences are actually very slight. They gain in importance only as social groups assign values to them.

It is of utmost importance, however, that teachers be made aware of these systematic decoding processes. A child who decodes <time> as /t æ:m/ is not deficient in his ability to pronounce the glide vowel most frequently heard in standard English. Nor is he misreading the word. Ironically, he is doing what any good reader ought to be doing—taking printed scratches and translating them into his own meaningful oral symbols. It might be said, in fact, that learning to read has little or nothing to do with a child's ability to handle standard English phonology. But it is tremendously important for the teacher to understand the child's phonological system in order to distinguish reading difficulties from the systematic features of the child's dialect. It is also important for the teacher to understand the child's phonological system in order to organize teaching materials into consistent grouping. For example, the writer once observed a teacher in a ghetto school tell beginning readers that the vowels of *fog, dog, hog,* and *log* were all the same. She then had the students repeat the words after her: /fɑg/, /dɔg/, /hɑg/, /lɔg/. The students heard the difference. This teacher never did. Learning the *-og* matrix is meaningful pedagogy if there is consistency in the production of that matrix /ɔ/ *or* /ɑ/. Either pattern is useful to the beginning reader who is being taught on the basis of pattern.

Grammatical Features

The analysis of the systematic grammatical structure of ghetto English (the linguistic *position* of such speakers) has proved to be a greater undertaking than one might suspect. Although a great deal has been learned about the verb system, negation patterns, question structures, possessives, pluralization, concord, and other things, relatively little knowledge has been translated into materials for beginning readers. Because grammar and syntax provide a different kind of decoding process than the phoneme-grapheme

relationships noted earlier, the task of the reading teacher is more complicated. Such a sentence as "John asked if Mary wore a coat" is frequently read by a ghetto child as "John asked did Mary wear a coat." Likewise, "Mary jumps up and down" is often read as "Mary jump up and down." In both instances, the reader is decoding primer book grammar into his own grammatical system. In no way is he misreading *did* for *if, wear* for *wore,* and *jump* for *jumps.* As far as the reading process goes, he has succeeded. If he fails to read these sentences adequately (that is, in any of the above ways), he has failed. If, for example, he were to read the first one as "John asked Mary if did she wear a coat" or as "John asked Mary if she wear a coat," one might consider this transformation to be a reading difficulty. The failure would be evidence of interference from one grammatical system to a *different* grammatical system, all of which brings one back to the fourth assumption of Wiener and Cromer—that a child would read adequately if the material and method were consistent with his behavior patterns.

If the major focus in the teaching of reading is on getting meaning from printed page to the reader's consciousness, there should be no hesitation about developing materials which match the child's grammatical system. (Such materials are, in fact, being developed by Joan Baratz and William A. Stewart at the Center for Applied Linguistics, Washington, D. C.) Expanding or changing his grammatical system is not part of the reading process as such and, quite likely, ought to be introduced gradually in keeping with the child's general social awareness in other areas.

At this point then, it is evident that some reading difficulties stem from a mismatch of teaching materials with the linguistic behavior of the learners. This condition has no bearing on the physiologically defective, or those who lack phonological or grammatical skills, or on the psychologically disrupted. It is a product of a cultural position which has its own system, its own problems, and its own beauty. This position must be understood much better if anything significant is to be done for those who hold it.

The Processive Dimension

The effort of linguists to deal with the cultural *position* of a large portion of children with reading difficulties has been described briefly. Still another way in which linguists can be useful to reading teachers might be called *processive.* By this is meant that linguists think about language-in-process in ways which reading pedagogy may find useful. Studies in the language acquisition of children, of course, fall into this purview. The teaching of reading has not always accommodated itself to the natural progression of children's language acquisition and has been guilty of what the writer refers to, elsewhere, as aphasic teaching (*4*). By this is meant that students, like victims of aphasia, are taught in the reverse order in which their learning can best take place. Teachers and textbooks too often

view their task from their own, not the students', stage in the learning process. Teachers' manuals which discuss the "four sounds of *a*" well illustrate this principle. The child, by the age of six, has a pretty fair grasp of the sounds of English. He is likely to have little or no grasp of the symbols which represent these sounds on paper. If a beginning reader is taught that the letter *a* has four sounds, the teaching runs counter to the learning process. Most reading teachers now agree that one should begin with a child where he is (with sounds) and move toward where he is going (toward letters) rather than vice versa. Yet there is still a great deal of work to be done before the teaching of reading can reach the stage where aphasic teaching is overcome and the *processive* dimension is well accounted for.

One such area is in syllabication. Annually thousands of third grade children are set to work finding the syllables in their reading workbooks.

From the linguist's viewpoint there are at least *three* questions concerning reading instruction which need to be answered in order for the treatment of syllabication to become maximally efficient. These questions deal with the syllabic consonant, the identification of syllables in general, and the reason for studying syllabication in the first place.

The Syllabic Consonant

Until very recently a syllable was most commonly defined as follows: ". . . a part of a word in which we hear one vowel sound . . ." (*Thorndike Barnhart Junior Dictionary*, p. 35). It was on this basis that the writer's eldest son muddled his way through third grade syllabication. Professional educators and researchers will appreciate the writer's difficulty in confronting his son's teacher with the fact that the boy was simply not hearing a vowel sound in the second syllable of words like *travel, weasel,* and *awful.* Instead he heard a phonetic /l/ and marked his workbook accordingly.

More recently, the *Thorndike Barnhart Junior Dictionary,* on page 37, has added a statement about certain syllabic consonants: "for some words of more than one syllable a vowel sound may not be heard in an unaccented syllable. In such words the *l* sound or the *n* sound takes the place of a vowel sound, and is called a syllabic consonant." This dictionary, upon which many reading texts rely, is consistent with syllabic *l* as long as the word is spelled with a final *-le* (*bundle, table, eagle*). But in such words as *bushel* and *easel,* there is apparent inconsistency (bush'əl and ē'zl). Yet an investigation of this apparent inconsistency reveals, surprisingly enough, a deeper regularity.

When a syllable at the end of a word ends in /l/, it is possible to predict whether this sound is preceded by the vowel /ə/. If the final consonant sound in the penultimate syllable in such words as *vigil, virile,* and *bushel* is /ǰ/, /č/, /r/, /š/, /ž/ or /l/, the schwa is present. If this consonant is any other sound, the final syllable is a syllabic /l/. In

forming an /l/ after /č/, for example, a speaker must move the tip of his tongue sufficiently far enough to require the pronunciation of a vowel /ə/ between these two consonants. This is true only for the sounds /ǰ/, /č/, /r/, /š/, /ž/ and /l/ before /l/. As a result, syllabic /l/ is impossible in these syllables. (A small set of such rules will also account for syllabic /n/, /r/, and /m/. Research on this problem is currently being carried out by the author.)

This rule seems to be the implicit basis for syllabication in the case of /l/ employed by the *Thorndike Barnhart dictionary*. Before this dictionary is given too much credit, however, it must be pointed out that this rule is violated in words which end in *-ful*. Thus, while *sniffle* is assigned a syllabic /l/ in conformity with the above principle, *awful* is inconsistently marked with a schwa before the /l/. (Many of these problems with syllabic consonants disappear if phoneme-grapheme correspondences are not insisted upon but, instead, written forms are assumed to reflect the organization of sounds at the morphophonemic level.)

One can see from these examples that a beginning reader who is learning syllabication may be handicapped by the very phonetic abilities he has been encouraged to develop and by certain inconsistencies in dictionaries. Nor have current reading texts treated syllabication with consistency. They are not likely to make a great deal of progress until dictionaries begin to treat the subject more deeply.

The Identification of Syllables

A linguist, looking at syllabication, might approach the problem in several ways. He may choose to think in terms of both phonology and grammar. He may choose to think of syllables as some kind of voiced continuant peak with borders which are, somehow, not like peaks. The major problems in syllable division seem to be at these borders, naturally enough. Although the point may be argued, assume that the linguist feels that syllables should be, at the same time, true to the phonology, grammar, and lexicon of the language. That is, they must satisfy criteria of the grammatical, lexical, and phonological components of language. Grammatical components such as *-ing* or *-ish* should be preserved as syllables in complex constructions such as *jump - ing* and *fool - ish* rather than *jum - ping* and *foo - lish*. Monosyllabic lexical components such as *some* in *something* should be preserved as syllables, preventing either *so-me-thing* or *so-mething*. Since stop consonants so frequently form the borders of syllables, where medial consonant clusters exist, they may be the best place to mark syllable division. Now, with these examples in mind, the writer proposes a series of semi-ordered syllabication rules.

Rule 1 Lexical rule: Syllable division is marked at compounds which contain clearly marked monosyllabic segments (ink-well, not in-kwell).

Rule 2 Grammatical rule: Syllable division is marked at inflections and/or affixes (love-ly, slopp-y, drumm-er, etc.) Note here that doubled spellings are irrelevant; syllables are not based on spellings. (Rules 1 and 2 can be said to be two cases of the same principle. That is, phonological material which can be shown to belong to one morpheme should not be assigned to another in syllabication. These cases are presented separately here for purposes of clarity and pedagogical sequencing.)

Rule 3 Phonological rule 1: When syllable splits are ambiguous grammatically, they can be split at medial consonant clusters (of differing consonants) if such clusters are present (tar-get, sil-ver, win-dow).

Rule 4 Phonological rule 2: When syllable borders are ambiguous grammatically and when they do not have consonant cluster borders, the syllabication should follow the pattern of monosyllabic words in English. That is, the phonological restrictions of English monosyllabic words may be applied to syllables which appear as parts of polysyllabic words. Thus, *tiger* and *spider* with glided, unchecked vowels which can appear word finally, as in *buy* and *high*, are split *ti-ger* and *spi-der*. On the other hand, *shadow*, *lemon*, and *lizard* with unglided, checked vowels which cannot appear finally / æ, ɛ, ɪ /, are split *shad-ow*, *lem-on*, and *liz-ard*. The unglided vowel /ə/, however, may form the right border of a syllable, as in *a-way*, *tel-e-phone*, and *llam-a*.

Rule 5 Phonological rule 3: When a voiced continuant such as /l/, /r/, /m/, or /n/ can be heard as the nucleus of the syllable (a syllabic consonant), it is marked as a separate syllable. Thus, *poodle* is *pood-le*, *dimple* is *dimp-le*, and *pupil* is *pup-il*.

These five rules were introduced as "semi-ordered" primarily because the phonological rules are fairly equal and rules 3, 4, or 5 may apply in any order. The most significant thing here is that the lexical rule takes precedence over the grammatical rule which, in turn, takes precedence over all the phonogical rules. It should also be noted here that these rules constitute a beginning toward a linguistic theory of syllabication. They do not account for all English words, although they handle a significantly large majority with a consistency hitherto absent from dictionaries and introductory reading materials.

It must also be noted here that these five rules *can* apply to both the syllables of sound and the syllables of writing. Past syllabication has been based on the printed word entirely, even though claims were made for the

usefulness of such activity in word attack. Past "rules" for end-line word splitting have accounted for the lexical rule in a nonrigorous fashion. (No restraint is known on *something* being split *so-me-thing*). Past rules have rather carefully accommodated the grammatical rule. The phonological rules have been only partially observed, naturally enough, for an orthographical orientation. Rules 4 and 5 were unformulated, and there was no notion of a hierarchical order.

The Reason for Studying Syllabication

The usefulness of syllabication for word attack may be seriously called to question in the traditional sense of the meaning of word attack. It is quite apparent, if the preceding semi-ordered rules are accepted, that a child must know a great deal about phoneme-grapheme relationships and morphophonemic spelling and a great deal about grammatical inflections and derivational affixes before he can become a successful syllable finder. In short, the solution to a well-defined theory of syllabication tells one that this feature of language seems to have less to do with initial reading skill than it does with general skill in the language arts. In order to find the proper syllable divisions, the child must already know the things he needs to know in order to be a successful beginning reader. On the other hand, by focussing on syllable identification, the teacher can determine whether the child has mastered these rules. That is, the child's ability to find syllables is really a test of his reading ability and like all good tests it should *teach,* perhaps by calling attention to what has been happening all along. In any case, it can be safely affirmed that if a child has mastered these five rules and can find syllables adequately, he should be able to meet new words, even nonsense words, with confidence. A child who syllabifies *unflurbly* as *un-flurb-ly* or *camip* as *cam-ip* evidences word attack skills which surely reflect sophistication, whether it is called reading or language arts.

In the processive dimension of reading, then, linguists ask questions about language acquisition and how teaching processes match or mismatch with it. One example of past cultural mismatch has been in the aphasic teaching associated with syllabication. Children are asked to do a task which is supposedly helpful in developing reading ability but which requires skills that evidence *developed* reading abilities. One has been giving a test while thinking that it was the homework. This is one aspect of the processive dimension which interests linguists. Another aspect is the semi-ordered rules themselves. With the advent of contemporary linguistics has come the notion of ordered rules in grammatical analysis. One is content not simply with finding rules but with seeing how they sequence. It seems clear, in the case of syllabication, that linguistic rule ordering is a very useful feature.

From this analysis, it should be clear that developers of reading materials and dictionary makers must rethink their entire approach to

syllabication and the reading process. Students have been plagued by inconsistent dictionary practice with respect to syllabic consonants, inadequate instruction in how to identify syllables, dictionary syllabication which is not faithful to the lexicon, grammar and phonology of the language, and an inadequate theory of pedagogical sequencing which does not distinguish between developing and developed skills. One by-product of such a situation ought to be embarrassment over the artificial separation between reading and the language arts. One might hope that future elementary textbooks will find it so difficult to distinguish the reading lessons from the language arts lessons that these hitherto separate subjects will merge into a more sensible unitary body.

Here, then, are two general areas in which linguistic research can help children with reading difficulties caused by mismatch of specific child culture to pedagogical materials. The positional dimension and the processive dimension are both legitimate fields in which linguists may provide many insights in the near future.

REFERENCES

1. Hughes, Anne E. "An Investigation of Certain Socio-linguistic Phenomena in the Vocabulary, Pronunciation and Grammar of Disadvantaged Preschool Children, Their Parents and Their Teachers in the Detroit Public Schools," unpublished doctoral thesis, Michigan State University, 1967. (For summary, see Roger W. Shuy, Walter A. Wolfram, and William K. Riley, *Linguistic Correlates of Social Stratification in Detroit Speech*. Final report, Cooperative Research Project 6-1347, U.S. Office of Education, 4, 1-10.)
2. Labov, William. *The Social Stratification of English in New York City*. Washington, D. C.: Center for Applied Linguistics, 1966; and Shuy, Wolfram, and Riley (see note 1).
3. See Marvin Loflin. *On the Structure of the Verb in a Dialect of American Negro English*, Office of Naval Research Group Psychology Branch, Technical Report No. 26, Center for Research in Social Behavior, University of Missouri; and Ralph W. Fasold, "Tense and the Form *Be* in Black English," to appear in *Current Viewpoints on Nonstandard English Be*, Roger W. Shuy (Ed.), Center for Applied Linguistics, Washington, D. C., 1968.
4. Shuy, Roger W. *Four Dimensions of Language in the Classroom* (in preparation), Dodd-Mead, 1969.
5. Wiener, Morton, and Ward Cromer. "Reading and Reading Difficulty: A Conceptual Analysis," *Harvard Educational Review*, No. 4, 37 (1967), 620-643.

An Operational Definition of Comprehension Instruction

JOHN R. BORMUTH
University of Chicago

The line of argument followed in this paper runs as follows: Instruction in reading comprehension is poor because there is almost no research of any value in the area. Nearly all this research and virtually all the instruction are based upon a conception of comprehension which is faulty and so subjective and nebulous that it is more misleading than helpful. The paper then proceeds to propose a more adequate conceptualization of comprehension and to show how this conceptualization can result in precise operational definitions of comprehension and comprehension instruction.

Comprehension is both one of the most important and one of the weakest areas of instruction. It has become almost trite to point out that much of the knowledge presented in instruction is presented through the medium of written language and that if a student cannot comprehend what he reads, he is almost certain to drop out of school—an act precipitating a long list of tragic consequences. Just how ineffective one is at teaching reading comprehension is being made increasingly clear—for example, by recent studies in sociolinguistics and the sociology of school achievement. Sociolinguists have shown that while many children learn one dialect in the home, their instruction is carried on in quite another dialect. The studies in the sociology of achievement show that dialect background correlates highly with school achievement especially in those areas of instruction which rely heavily upon reading comprehension. Coleman (*4*) has felt compelled to claim that school instruction has only negligible influence upon children's acquisition of skills, such as reading comprehension.

The reason is not hard to find. There is only a meager body of research in the area, and it is of a generally poor quality. After reviewing this research Harris (*5*) concluded that it demonstrated little that was

of instructional value. As a consequence there is little knowledge upon which to base a curriculum.

Probably the source of this dismal situation is the fact that comprehension is presently defined almost wholely in terms of mental processes. Since mental processes are not directly observable, attempts to describe them turn out to be nebulous and confusing to practically everyone except, perhaps, the person doing the description. These definitions are invented in this way. The investigator begins by trying to examine his own mental activities as he reads, and as he examines them he tries to identify each of the different processes he employs. Then he names each of his mental processes and tries to describe them. Finally, he may make up a test to measure each process. To check himself he sometimes submits his tests to a panel which judges whether the items in each test are homogeneous.

There are at least two major problems with this approach. The most important is the fact that the items produced by this method correspond in no definite way to the *language* skills which make up the comprehension skills. For example, these methods have produced names of processes like comprehending the important facts, making inferences, comprehending the main idea, and so on. These names and the process descriptions leave the teacher and researcher still groping about trying to decide just what these processes have to do with *language*. Both the researcher and the teacher know that children who can understand *language* must perform specific acts, such as, modifying nouns by gerunds which follow them or verbs by the associated adverbs. Yet the traditional definitions of comprehension are totally silent on these matters.

Nor is this method of defining exercises and tests sufficiently objective to be of much use to either teachers or researchers. Teachers are told, for example, to prepare exercises in which they give children practice in comprehending the important facts in a passage. But the definitions of this process never explain what a fact might be or how to decide if a fact is important. Thus, if a teacher is faced with the sentence *The diminutive lad mounted the steed,* he has no way to decide if the sentence contains just a single fact or if it contains numerous facts, such as, that the steed was mounted, that the lad mounted something, or that the lad was diminutive. How the teacher or the researcher is supposed to decide which facts are the important ones is left equally obscure. Since virtually all the processes are defined in an equally nebulous manner, serious questions must be raised about what, if anything, these names and descriptive processes refer to. Consequently, most researchers have abandoned the study of comprehension until more rigorous definitions can be developed; and a great many teachers who have received extensive training in teaching methods in reading testify that they, themselves, feel incompetent to teach comprehension, feeling fairly certain that either they or the experts are confused.

The purpose of this paper is to attempt to clarify the conception of comprehension in order to demonstrate how this concept can be given rigorous operational definition. From the outset, two points should be clear. These remarks pertain only to reading comprehension, and they deal chiefly with what is subjectively labeled as literal and inferential comprehension. The decision to defer consideration of critical, evaluative, and aesthetic comprehension was based upon the following considerations: 1) that a person cannot criticize, evaluate, or aesthetically appreciate materials he cannot comprehend in any literal sense; 2) that one neither understands nor teaches effectively the literal and inferential comprehension skills; and 3) that clarifying one's understanding of the literal and inferential processes is the essential first step to clarifying one's understanding of the other processes.

General Definition of Comprehension

A careful examination of the use of the term *comprehension* shows that the term refers to an increase in the amount of information an individual is able to exhibit as a consequence of reading a passage of verbal materials. Stated more precisely, *comprehension ability is thought to be a set of generalized knowledge-acquisition skills which permit people to acquire and exhibit information gained as a consequence of reading printed language.* When this definition is accepted as the general definition of comprehension, a further analysis produces interesting results. This section will spell out those results.

Language as the Stimulus. This definition asserts that comprehension is a response to the *language system.* That is, a language is a system which can take an infinite number of forms to signal any semantic information whatever, and a knowledge of how that system works permits people to acquire whatever information is encoded *in language.* Consequently, the content of comprehension instruction might be said to be the rules describing how the language system works to transmit information; and the tasks of research in reading comprehension instruction are 1) to enumerate these rules, 2) to develop teaching tasks for shaping children's behaviors in the manners described by these rules, and 3) to organize them into a systematic sequence for instruction by determining their relative complexities.

Specifically, comprehension is not just a set of mental processes which can be defined independent of language. Rather, it is a set of processes which operate on specific features of language. And instruction must be systematically designed to assure that children learn those systems by which language signals meaning. These signaling systems include at least 1) the semantic meanings of words; 2) the ways word affixes influence the semantic meanings and syntactic functions of words; 3) the ways phrase and deep structures are assigned to sentences; 4) the ways the surface and deep structures of sentences govern the modifications of word and phrase meaning; 5) the identification of antecedents of

pronouns, pro-verbs, anaphora, and other prostructures; and 6) the ways structures are assigned to paragraphs and larger units of discourse and those structures used to modify sentence, paragraph, and section meanings. Under no circumstance, though, should this matter be interpreted as the claim that children should be taught formal grammer and rhetoric. Children can learn to respond correctly to the signaling systems of language without having conscious knowledge of even the existence of formal grammer and rhetoric.

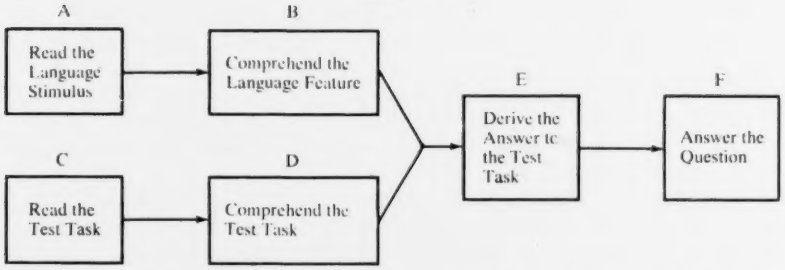
Unit of Comprehension Instruction. This definition of comprehension includes as comprehension processes not only the processes necessary to acquire the information encoded in language but also the processes necessary to exhibit that information. In concrete terms, one must teach children whatever processes are necessary to acquire information from language, and one must *also* teach them whatever additional skills may be necessary for them to answer questions or respond to whatever other tasks given them to see if they can exhibit that knowledge.

Using a test task is an absolute and inescapable necessity in instruction. A teacher must be able to observe whether a child has learned what is being taught; otherwise, the teacher has no way of knowing if the child has acquired the language decoding skills and, therefore, does not know whether to provide additional instruction. Indeed, the teacher does not even know whether the child is practicing the correct process, the incorrect process, or blithely ignoring the whole situation. Likewise, the child has no feedback on the results of his efforts and cannot guide his own learning. Thus, it is not sufficient for a teacher to just repeatedly expose children to some linguistic feature which signals information. The teacher must also provide the child with tasks which require him to make an overt response which shows that he has acquired that information. For example, if one wishes to teach a child to decode nouns modified by adjectives, one must not only present him with sentences like *The small lad is wearing a hat* but one must also ask him questions like *How large is the boy who is wearing a hat.*

But when one admits that this argument is true, then one sees immediately that the thing being taught is not just the interpretation of linguistic features. In addition, one must also teach the child whatever skills are necessary to interpret and answer the questions which test his knowledge of the information signaled by those linguistic features. The language stimulus, the question, and the response must, therefore, be considered the *unit of instruction.*

Figure 1 will help illustrate this point. When one thinks of teaching comprehension, one usually thinks he is teaching just those processes represented by block B in the figure. However, there is no way to provide effective instruction unless one can tell whether the child is

Figure 1



Analysis of the major processes which constitute the components involved in responding correctly to an instructional unit.

responding correctly; so by requiring the child to respond to a test task, this introduces the question-answering processes represented by blocks C, D, E, and F, which the child must learn also.

This fact inposes important requirements on the design of instruction. The normal wish is to sequence the instruction from the easy to the difficult processes. But Figure 1 shows that both the questions and the linguistic features can provide independent sources of difficutly. Hence, research must be designed in such a way to determine not only the relative difficulties of different types of language features but also the relative difficulties of the various kinds of questions and other test tasks. Without this information, instruction cannot be sequenced appropriately.

Comprehension as an Increase in Information. The general definition stated that only information which is gained as a consequence of reading a passage may be regarded as representing comprehension. The consequences of accepting this proposition are that one must reject scores from virtually every comprehension test currently being used in classrooms and laboratories. The reason is this. Comprehension is defined as the ability to acquire information from a passage, but one tries to measure it by finding out how many questions the person can answer on a test given him only after he has read the passage. This procedure ignores the facts that it is almost impossible to find a passage dealing with information about which a person knows absolutely nothing and that he could probably have used this information to answer some of the questions even before he had read the passage. Consequently, scores on comprehension tests given in the usual way have two components: those questions the student could have answered without reading the passage and those questions he was able to answer only as a consequence of reading a passage. Only the latter may be definitely said to represent knowledge gained through reading.

This distinction is probably not terribly significant in instructional exercises where a number of questions of the same type are used. It would be highly unlikely that a student would know the answers to many of the questions used in the exercises, and so he is likely to receive ample practice. On the other hand, researchers must be wary of the problems presented by this fact. Suppose a subject's comprehension were inversely proportional to the amount of prior knowledge he could exhibit before he read a passage. This is a reasonable expectation if he were bored by the repetitiousness of the passage or if his prior knowledge would permit him to get a very high score before he read the passage. This fact could lead researchers to reject theories which were, in fact, true or accept theories which were, in fact, false.

It should be pointed out that one can estimate the amount of knowledge a subject has of a passage without giving him the same test twice. This estimate may be obtained by constructing twice as many items as usual and giving a randomly selected half of the items to the subject before he has read the passage and the other half after he has read it. Another solution that should be explored is the possibility of pretesting the items on a different group and discarding those items which a greater-than-chance number of subjects can answer without having read the passage.

Distinction between Comprehension and Achievement Testing. Most people are hard put to tell the difference between a comprehension test and an achievement test made from the same set of written materials. Since the two tests may contain exactly the same items, the distinctions are far more subtle. The most important distinction is in how the scores are interpreted. If the test is an achievement test, a score on it is interpreted as representing how much of the knowledge in that particular passage the student has been able to acquire. When the test is regarded as a comprehension test, the score is interpreted as representing how well the student is able to acquire knowledge from written language of the type represented by that passage. In other words, interpreting a score as a comprehension score requires one to generalize the student's performance on that test to his performance on the tests which could be made from a population of passages. No such generalization is made from an achievement test score. The second distinction that may be made is that when the items in an achievement test are grouped into subtests, the grouping is done only along subject matter category lines while in comprehension tests the grouping is done by putting into subtests either those items which measure ability to interpret the same linguistic features or those which measure knowledge in the same subject-matter category.

The distinction between comprehension and achievement tests is of critical importance when one is considering the validity of a comprehension test. Scores on the test are valid for predicting performance only on language features like those tested by the items in the test. In particular, the test maker should state the population of passages

from which he drew his test passages along with a breakdown of the language features tested by the items. This requirement holds not just for makers of standardized tests but also for researchers who claim they are studying comprehension. Failure to do so makes the test results uninterpretable. The fact that researchers have not met this requirement in the past is sufficient reason to reject virtually all the studies in the area of comprehension as being uninterpretable. (The writer here includes one or two of his own.)

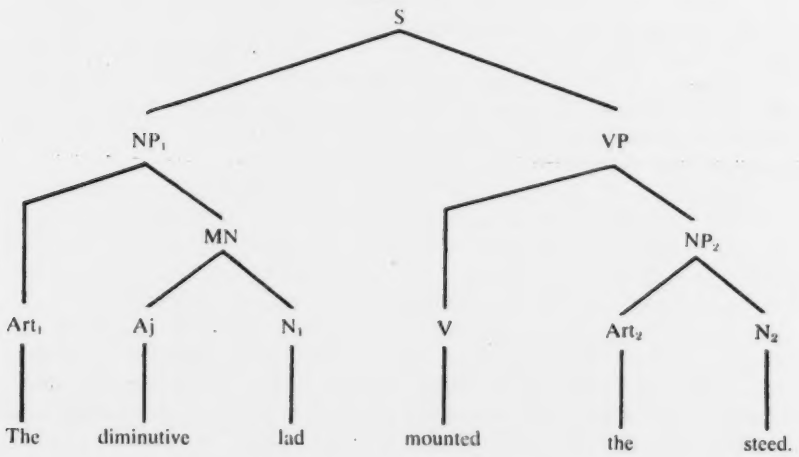
Criteria for Adequate Definitions. To be adequate, definitions of comprehension processes must meet at least four criteria. First, the tasks must correspond to the linguistic features one tries to teach children to understand. For example, in the sentence *The diminutive lad mounted the steed,* one could construct the question *What kind of boy climbed on the horse?* And then one could argue that this question provides a test of whether the child modified the meaning of the noun *lad* using the meaning of the adjective *diminutive.* Now if a general rule could be devised which could test all adjective-noun modifications, one could say that this rule defines a class of tasks which measure or correspond to one of the language-comprehension skills one is trying to teach. The second criterion is that the task must, in fact, force the child to use the skill one thinks it does. Third, the definitions which describe how the tasks are constructed should be as objective as possible. Or, conversely, they should require as little subjective judgment as possible in order to derive the tasks. Finally, for obvious reasons, they should be of a nature that they can be easily and inexpensively constructed by teachers.

Operational Definitions of Questions

The purpose of this section is to demonstrate how one type of test task, the comprehension question, can be redefined in such a way that it meets the criteria just discussed. From the beginning it should be clear that these definitions deal only with what are sometimes referred to as literal comprehension questions. However, it is specifically claimed that any type of comprehension question can, at least potentially, be defined with equal rigor and specificity. It is also important to point out that, while all of these definitions are in some degree dependent upon transformational-generative grammer, structural linguistics, alone, does not provide enough descriptive power to define all the classes of tasks which must be dealt with in comprehension. It was also necessary to use descriptive devices taken from rhetoric, semantics, and logic. This point is important because much current writing has led many to believe that structural linguistics is, by itself, sufficient to solve all the problems of reading instruction. Finally, because of time limitations, it was not possible to spell out the details of the syntactic transformations used.

Theory of Comprehension Questions. Space does not permit giving a detailed description of the theory underlying comprehension questions, but it might be summarized in this way. A sentence is a device for encoding a single complex concept. The subject noun of a sentence refers to a broad class of objects or events. The remaining words and phrases in the sentence serve directly or indirectly to restrict or modify the meaning of the subject noun. The modification of its meaning takes place in a complex but systematic manner. The phrase structure of the sentence determines which word or phrase modifies another and the order in which these modifications occur. Figure 2

Figure 2



Wh-Questions

S—Who mounted the steed?
MN—Which lad mounted the steed?
VP—What did the diminutive lad mount?

S—What did the diminutive lad do?
MN—The diminutive what mounted the steed?
VP—What did the diminutive lad do to the steed?

Phrase-structure diagram of a sentence and the wh-questions deleting lexical nodes in the sentence.

will help to illustrate this process. The theory claims that a sentence is comprehended in generally bottom-to-top and left-to-right directions. Thus, the first modification in the sentence shown in Figure 2 is the modification of *lad* by *diminutive*, restricting the referent of the phrase as a whole to just those lads who are diminutive. Next, the modified noun, the MN phrase, is modified to a single instance of the concept of *diminutive lad*. This process continues until the subject has been modified by the predicate and until the single concept represented by the sentence as a whole, the symbol *S*, is attained.

Questions are thought to test a person's knowledge of those modifications which occur between lexical constituents. Roughly speaking, a lexical constituent is a word which is classified as a noun, verb, adjective, or adverb or it is a phrase containing a lexical word. What follows is a brief description of these questions. All of the definitions given have been described with greater detail in another paper (*1*).

Rote Wh- Questions. A wh- question is made in approximately this way. A lexical constituent is deleted from the sentence. It is replaced by one of the wh- pro-words. The wh- pro-words are words like who, what, when, where, how, and so on. Next, in some questions the wh- word is shifted to the front of the question, and the forms of the auxiliary and main verbs are adjusted appropriately. The details of this procedure are discussed by Thomas (*6*), Bach (*1*), and Chomsky (*3*), and their discussions should be read in that order by novices. The correct answers to these questions are the constituents which the wh- word replaced. Figure 2 shows the wh- questions which can be directly derived from that sentence. The symbol to the left of each question shows the modification tested by that question.

Questions of this type are, by themselves, relatively uninteresting. It is by no means certain that they actually test comprehension. For example, given a sentence containing nonsense words such as *The melfip delfebbed the worglop*, even fairly young children can answer wh- questions like *Who delfebbed the worglop*, indicating that, at least in some situations, questions of this type do not necessarily require what one ordinarily thinks of as being comprehension. For this reason the writer has labled them *rote* questions. However, the transformations by which rote questions are derived are extremely important because they provide the basis for a large variety of questions which hold much greater interest.

True-False Questions. Another type of question is that which is answerable by the responses yes-no or true-false. These are shown by examples B, C, and D in Illustration 1. Because their answers are of the true-false variety and because they are also a type of rote question, the writer considers them uninteresting; therefore, transformations by which they are derived will not be discussed.

Transform Questions. In the wh- rote question the word orders of the question and the sentence are almost identical. In the transform question this similarity of word order is not so great. Lines E and F of Illustration 1 show how transform questions are made. First, a paraphrase transformation is performed on the sentence to derive a new form. For example, starting with the sentence *The boy rode the horse*, one can derive the sentences *The horse was ridden by the boy*, *It was the boy who rode the horse*, or *It was the horse which was ridden by the boy*. Second, a wh- question is derived not from the base

Illustration 1. Examples of the types of questions which test the modifications in texts.

LANGUAGE TEXT

(1) The diminutive lad mounted the steed. (2) He fell off the steed.
(3) His arm was broken.

QUESTION TYPES

Rote Question

A. Wh-: Who mounted the steed? (The diminutive lad)
B. Tag: The diminutive lad mounted the steed, didn't he?
C. Yes/No: Did the diminutive lad mount the steed?
D. Inflectional: The diminutive lad mounted the steed?

Transform Question

E. Derived Sentence: The steed was mounted by the diminutive lad.
F. Transform Question: By whom was the steed mounted? (The diminutive lad)

Semantic Substitute Question

G. Derived Sentence: The small boy climbed on the spirited horse.
H. Semantic Substitute Question: Who climbed on the spirited horse? (The small boy)

Compound Question

I. Transform Derivation: The steed was mounted by the diminutive lad.
J. Semantic Derivation: The spirited horse was climbed on by the small boy.
K. Compound Question: By whom was the spirited horse climbed on? (The small boy)

Semantically Cued Question

L. What person mounted the steed? (The diminutive lad)

Anaphoric Question

M. Derived Sentence: The diminutive lad's arm was broken.
N. Anaphoric Question: Whose arm was broken? (The diminutive lad's)

Intersentence Relationship Question

O. Derived Sentence: His falling off the steed caused the breaking of the diminutive lad's arm.
P. Intersentence Question: What caused the breaking of the diminutive lad's arm? (His falling off the steed)

sentence which the student actually reads but from one of these derived sentences which were derived purely for the purpose of writing questions.

Semantic Substitute Questions. Another important class of questions is called the semantic substitute question. Semantic substitute questions are made by the two-stage process shown in lines G and H in Illustration 1. It begins by substituting a synonmous word or phrase for one or more of the words or phrases in the sentence, and then wh- questions are made from the sentence derived in this way. Again, the derived sentence is purely a convenience of the question writer and is not something the student sees.

Any synonym substituted must have either a meaning identical to the word in the sentence or it may be a more general term which

hierarchically includes the term used in the base sentence. For example, one can substitute *horse* for *steed* because all steeds are horses, but one cannot substitute *steed* for *horse* because not all horses are steeds —nags, to mention one.

Compound Questions. It is possible to derive still another class of questions by deriving, first, syntactic paraphrase of the base sentence and then, a semantic substitute sentence from the syntactic paraphrase sentence. The wh- questions are then based on the latter. Lines I, J, and K of Illustration 1 show this procedure.

Semantically Cued Questions. . . . . An example of the type of question called the semantically cued question is shown in line L. Semantically cued questions are derived by replacing the deleted constituent with both a wh- word and a very general synonym which is hierarchically related to the deleted constituent. In line L, for example, the words *What person, What male,* or *What youth* could also have been substituted for *The diminutive lad.*

Anaphoric Question. An anaphora is a word or phrase which stands for some phrase, sentence, or larger unit in a passage. The pronouns *He* in the sentences at the top of Illustration 1 are anaphora. However, any part of speech or any segment of text can be anaphorized. Imagine a paragraph discussing a famine in India and a following paragraph which began with the words *This situation*; those words would be regarded as an anaphora, and the entire preceding paragraph would be regarded as its antecedent. In other words, whatever modified the words *This situation* would, in fact, modify the concept represented by the entire antecedent. In order to test comprehension of anaphora, anaphoric questions are made by the two-stage procedure shown on lines M and N. A sentence is derived by deleting the anaphora from its sentence, replacing it with its antecedent, and then forming a wh- question which deletes either the anaphora or the remainder of the derived sentence.

Intersentence Relationship Questions. Just the fact that two sentences occur next to each other signals information. For example, in their present order the last two sentences at the top of Illustration 1 are interpreted as signaling that falling off the horse caused the breaking of the arm. But if their order were reversed, then the interpretation would be that the broken arm caused the fall from the horse. Questions which test the comprehension of these relationships are made by a three-stage procedure. First, the relationships between the sentences and sentence groups are identified. For example, the relationship between the first sentence and the other two could be expressed as *1 happened before 2-3,* and the relationship between sentences 2 and 3 could be expressed as *2 caused 3.* Second, the sentences are nominalized and inserted in the sentence frame expressing the relationship. Thus, one can form one sentence from all three to obtain *The diminutive lad's mounting of the steed happened before his falling off the steed caused*

the breaking of his arm. Third, wh- questions are then formed in such a way that one of the nominalized sentences is deleted.

Defining Other Question Types. The question types described here are not sufficient to test or teach the full range of processes identified as comprehension processes. However, the writer specifically claims that *any question which measures a comprehension process of any type can and must be given a definition of the type presented here*. The procedure for constructing the definitions presented started with the selection of items from existing exercises and tests. The next step was to analyze the question and the passage to which the question pertained for the purpose of constructing rules by which the question and its response could be derived directly from the language in the passage. Additional descriptive devices, such as the semantic substitution rules, were added only when it was absolutely essential to do so. Next the questions were grouped on the basis of the similarity of the rules required to derive them. Then the rules were generalized so that the whole class of items could be derived by using the same general rule.

In every case it was possible to use descriptive devices already in existence. The wh- question transformation comes from structural linguistics; the semantic substitution paradigm comes from logic and semantics; and the procedures used to derive the anaphora and the intersentence relationship questions come from rhetoric, logic, and structural linguistics. Perhaps the chief difficulty encountered in this work is the lack of thoroughness on the part of scholars in the relevant disciplines. For example, the details of even something as simple as the wh- question transformation have not yet been worked out by linguists. To some extent this procedure is simply a matter of cataloging, for the basic concepts and descriptive devices have been fairly well defined. In other cases, such as the intersentence relationships, the investigator receives almost no help and must do that job himself.

Advantages of Operationally Defining Questions

The object of presenting these definitions of question types here was not to demonstrate the degree of detail or objective rigor with which comprehension processes can be defined. Indeed, they have been defined with far greater detail and rigor elsewhere (*2*). Rather, the point was to demonstrate two things: first, that the processes can be adequately defined and, second, that they must be given adequate definitions. One can accrue many benefits from developing these definitions.

First, these definitions are absolutely essential in order to provide a rational basis for instruction in comprehension. It hardly needs to be pointed out that an instructional exercise or a test should be relevant to the processes taught and that in comprehension instruction an attempt is made to teach children to decode language. The tradi-

tional definitions of the comprehension processes focused almost entirely upon what a few people conjectured was going on in their minds and almost totally ignored the really obvious fact that it was *language* which was being comprehended. As a consequence, it was not possible to say just what language skills were needed in order to master these vaguely defined processes. The definitions of the type offered here do not ignore the fact that comprehension represents a mental process. Rather, they bring balance by focusing attention upon the linguistic features which serve as the stimuli of those processes.

Second, definitions of this type make it possible to do really respectable scientific research in the area of comprehension instruction. Formerly, investigators could never be certain what processes they were actually studying because their definitions were so vague that they could not be certain whether their tests were homogeneous. Further, there was no hope of ever applying the results of their research, because teachers could not be sure that their practice exercises contained the same kinds of questions the researcher had used. Using definitions of the type offered here eliminates both problems.

Third, definitions of this type are eminently usable by teachers. At first glance, it would appear that a great deal of formal knowledge of linguistics is required to produce questions of the types described here. This supposition is not the case. Teachers, having no more knowledge of linguistics than they gained in high school English classes, can quickly learn to produce accurately questions of whatever type is desired and in any quantity required.

Constructing these definitions will require a great deal of hard and careful work. But it is essential that this work be undertaken immediately and with great vigor. Comprehension instruction is ineffective because it suffers from a dearth of supporting research, and it is not possible to perform useful research in this area until the comprehension processes have been given operational definitions of the type described here.

REFERENCES

1. Bach, E. *An Introduction to Transformational Grammars.* New York: Holt, Rinehart, and Winston, 1964.
2. Bormuth, J. R. "On the Theory of Achievement Test Items," 1968 (in press).
3. Chomsky, N. *Aspects of the Theory of Syntax.* Cambridge: M.I.T. Press, 1965.
4. Coleman, J. S., et al. *Equality of Educational Opportunity.* Washington, D. C.: U. S. Government Printing Office, 1966.
5. Harris, A. J. *How to Increase Reading Ability.* New York: Longmans Green, 1961
6. Thomas, O. *Transformational Grammar and the Teacher of English.* New York: Holt, Rinehart, and Winston, 1965.

Psycholinguistic Implications for a Systems of Communication Model

ROBERT B. RUDDELL
University of California at Berkeley

The role of psycholinguistics in studying language skills learning is undoubtedly more powerful than either that of linguistics or psychology considered separately. Although the linguist has offered a description of language competency through possible systems for describing and generating sentences and the psychologist has pursued learning theory from various viewpoints, the psycholinguist is interested in exploring the psychological reality of linguistic descriptions. In brief, the viewpoint of the psycholinguist as described by Miller is that of accepting "a more realistic conception of what language is" (*3*). A major goal of the psycholinguist which may be realized in the distant future is the development of a theory or theories of language performance.

The relationship between psycholinguistics and reading instruction is apparent if one views the former discipline as developing an understanding and explaining of language processing and the latter as having its central focus on the enhancement of the ability to decode and comprehend language. This relationship is even more obvious as one considers the definition of reading as a complex psycholinguistic behavior which consists of decoding written language units, processing the resulting language counterparts through structural and semantic dimensions, and interpreting the deep structure data relative to an individual's established objectives.

A central problem, however, in attempting to relate the findings of linguistics and psycholinguistics to the language skill of reading is ironically that of communication. The many dimensions of these two disciplines have caused the reading specialist and reading researcher to ask how the multitude of individual components are related to one another and in turn to language skills development. The purpose of this discussion is to provide an overview of selected linguistic and psycho-

linguistic variables related to decoding and comprehending language, to briefly examine their psychological reality, and in summation to incorporate these variables into a systems of communication model.

Transformational and semantic theory has proposed that language may be viewed on several levels. The first level is considered to be the surface structure and encompasses morphemic and syntactic structures which are realized in the form of the graphemic, morphographemic, phonemic, and morphophonemic systems. It is at this level that reading instruction considers the decoding process. The second level consists of structural and semantic readings which make provision for processing language for interpretation. The various transformational and rewrite rules and the structural reading, as well as an individual's mental dictionary of semantic readings, are considered to be incorporated into this level.

The third and least-understood level consists of the deep structure of language where it is hypothesized that the syntactic and semantic components of the language are integrated for language interpretation and stored in memory. This article will initially examine the decoding process, representing one dimension of the surface structure level. Next, the comprehension process encompassing the syntactic dimension of surface structure, the structural and semantic readings, and the deep structure will be considered. A minor emphasis will be given to the role of affective mobilizers and cognitive strategies in language processing. And finally, a systems of communication model will be presented to summarize the discussion relative to reading and language skills processing.

The Decoding Process

One of the central tasks of early reading instruction is that of discovering the nature of the correlation between printed units and their oral counterparts. Instructional approaches have placed varying degrees of emphasis on a variety of decoding units. These include careful control of "regularities" and "irregularities" in grapheme-phoneme correspondences, notably vowels; spelling sound units which are related to an intermediate level unit known as the morphophoneme; and a phonologically based unit known as the vocalic-center group which closely approximates the syllable and in certain instances the smallest significant meaningful language unit or morpheme.

Most reading programs place some degree of emphasis on these various units at some point in the program although the exact structure and sequencing of these units may not always be obvious. Nevertheless, decoding skills have been taught successfully by placing special emphasis on one or a combination of these units. Perhaps a more scientific statement would be that children have learned to decode while being instructed through these various approaches. The latter statement

leaves open the possibility that in some manner children are independently able to arrive at an optimal decoding unit depending upon their own cognitive strategy and the particular decoding approach used. But the key question at this point asks what research evidence is available to support a particular perceptual unit or units leading to decoding skill development in reading instruction. Parallel questions not considered in this discussion ask if a variety of units should be considered in the instructional program, at what point in a developmental sequence should they be introduced for maxium utilization, and is there any relationship between specific linguistic units and learner characteristics.

Grapheme-Phoneme Correspondences. The recommendation that initial words be introduced on the basis of grouped grapheme-phoneme consistencies has been proposed by Soffietti (*47*), Fries (*12*), Smith (*49*), Hall (*20*), and Bloomfield (*4*). These individuals have expressed the opinion that the inconsistencies of the English orthography place a limitation on the acquisition of sound-symbol correspondences as presently developed in widely used reading textbooks. Although the results have been inconsistent in investigations varying the degree of emphasis on sound-symbol correspondences and related generalizations, some early studies have revealed superior results for phonic emphasis at early grade levels, particularly in word recognition (*3, 26, 48*). More recently the work of Hayes (*22*), Ruddell (*40*), Hahn (*19*), Tanzer and Alpert (51), Mazurkiewicz (29), and Downing (9) have lent support to the value of greater consistency in the introduction of sound-letter correspondences. Additionally, the consistent replication of research findings discussed by Chall (6) also supports the logical expectation that an approach to decoding which helps the child grasp the nature of the English writing code would be of value.

From the standpoint of information transfer the research by Samuels and Jeffrey (43) emphasizes the value of sound-letter correspondence units. In their research psuedo letters were designed to represent English phonemes and kindergarten subjects were taught to decode on the basis of sound-letter correspondences and on the basis of "whole words." The findings indicated that subjects taught by the first method were more effective in transferring their skills to "new words" than were those subjects taught by the second method. The emphasis on individual correspondences appears to provide a lower error rate and more effective decoding skill than does attention to word identification based on single features.

In a later study the same researchers (*23*) replicated aspects of the above study with similar findings. However, they attributed their results in part to one aspect of the experimental treatment which taught the subjects to blend phonemes represented by the pseudo letters into words. These findings are similar to those of Silberman (*44*) in that subjects were unable to transfer correspondence information to new

words unless they had received phonic-blend instruction. The findings may be interpreted to suggest that sound blending places the phonemes in a natural sound-unit context constituting a more elaborated decoding unit which is of value in transferring sound-letter correspondence information to new letter patterns and words.

Morphographemic-Morphophonemic Correspondences. If a decoding program is to account for the nature of the English writing system, it is necessary to consider spelling units or letter patterns which provide for prediction of sound correspondences beyond the grapheme-phoneme correspondence level. Venezky (*52*), Wardhaugh (*53*), and Reed (*38*) have discussed this concern with reference to the morphophoneme. This unit represents an intermediate unit between the phoneme and morpheme and may be thought of as a sound-spelling pattern unit or morphophonemic-morphographemic system. For example, in considering the words "extreme" and "extremity" one might point to the second *e* grapheme and note that there is little regularity in its representation of a given sound. However, when one considers these two words on the morphophonemic level, a very regular pattern is immediately obvious. In the alterations extreme-extremity, obscene-obscenity, supreme-supremity, one observes a consistent shift in the sound value (/iy/ to /i/) with the addition of the suffix *-ity*. Although some reading programs have developed a few alternations—such as that found in the final *e* marker (sit /i/, site /ay/)—very little consideration has been given to detailed study and research in this area.

Venezky has emphasized that a distinction needs to be made between spelling-sound patterns based on the spelling system and those based on phonological habits. In the first case children probably need to be taught the generalization that the letter *c* represents /s/ when followed by *e, i,* or *y* (e.g., city/sitiy/) and represents /k/ otherwise (e.g., cat /kæt/). However, the generalization that final consonant *s* is pronounced as /z/ following voiced sounds (e.g., dog*s* /z/), as /ə z/ after /s, z, š, ž, č, ǰ/ (e.g., buzze*s* /ə z/) and as /s/ in all other contexts (e.g., hop*s* /s/) is phonological in nature. For this reason the native speaker will automatically produce this change and there would seem to be little need to teach it.

An intensive research effort is needed to examine the contribution of the value of morphophonemic generalizations for reading instruction. One basic question might explore the possible advantage of near simultaneous introduction of contrasting letter patterns representing different but consistent vowel values (e.g., bat, bate), in contrast to sequencing grapheme-phoneme correspondences on the basis of "consistent" vowel correspondences (e.g., bat, mat), as is the case in many recently published reading programs. The research by Levin and Watson (*28*), although limited in scope, has demonstrated possible value in establishing a "set for diversity" in decoding and may be interpreted to lend some support to the former consideration.

Vocalic Center Group, Morpheme. Hanson and Rodgers (*21*) have posited that a linguistic unit identified as the vocalic-center group provides for high transfer value in decoding. This unit defined as "a vowel nucleus with 0-3 preceding and 0-4 following consonants" (*39*) is phonologically rather than semantically based. In most cases, however, this unit would parallel that of the syllable as defined by the lexicographer. The rationale for considering such a unit is that phonological segmentation is of greater significance than morphological segmentation for the early reader. Rodgers has reported one experiment in which children were asked to repeat disyllabic words (e.g., toas-ter) and bimorphemic words (e.g., toast-er) after the investigator. Their errors were found to favor redivision along the syllabic or phonological rather than along morphological breaks. It should be pointed out, however, that many words classified along phonological boundaries (e.g., quick-ly) will also be classified in an identical fashion along morphological boundaries (e.g., quick-ly).

Other research, notably that of Gibson and her colleagues (*14*), has explored the presence of a higher order unit formed by grapheme-phoneme correspondences. This research has demonstrated that children in the early stages of reading have developed higher-order generalizations which provide for decoding pseudolinguistic letter patterns following English spelling expectancies. The children appeared to perceive regularities in sound-letter correspondences and transfer these to decoding unfamiliar trigrams even though taught by what the researchers refer to as the "whole word" approach.

Additional work by Gibson, et al (*13*), has demonstrated that adult subjects perceive pseudolinguistic trigrams more easily when they follow English spelling generalizations or pronounceable units (e.g.,*BIF*) than when they are less pronounceable (e.g., *IBF*) or more meaningful (e.g., *FBI*). Because the task of the reader is that of decoding written letter patterns and transferring them into oral counterparts, pronounceable letter combinations would seem to be of significant value. On the other hand, meaningful trigrams, such as *FBI*, require the reader to work with three units rather than one. It was noted that the latter type of trigram was more easily recalled than the pronounceable unit. The ease in recall of the meaningful unit was attributed to known and exhaustible storage categories while the pronounceable trigram syllables would call for an extremely large number of categories and be more difficult to retrieve. The researchers concluded that pronounceability was the better grouping principle for reading. This conclusion lends support to the validity of the previously discussed vocalic-center group and in certain instances the corresponding morpheme.

At this point the discussion has considered several decoding units and their psychological real value for developing decoding skills. It would appear that the following units are psychologically real decoding

units as used by early readers: grapheme-phoneme correspondences; morphographemic-morphophonemic patterns; and vocalic-center groups and in some cases corresponding morphemes. Upon initial examination the above units appear to be mutually exclusive. This condition may not be so obvious, however, when operationalized in the instructional program. The great majority of linguistically influenced programs which attempt to control for sound-letter correspondences do not teach correspondences in isolation. For the most part, this learning is accomplished through initial consonant substitution, final consonant substitution, and vowel substitution contrasts. For example, the matrix in Figure 1 accounts for emphasis on initial consonants b/b/ and m/m/ in context; medial vowels a/ae/ and i/i/ in context; a morphophonemic pattern contrast with a vowel shift from /ae/ to /ey/; and utilizes the vocalic-center groups and corresponding morphemes.

Figure 1

Commonalities In Decoding Units

	-at	*-ate*	*-it*
b-	b*at*	b*ate*	*b*it
m-	*m*at	mate	*m*it

This example greatly oversimplifies the discussion but serves to illustrate the operational economy which is possible in teaching various decoding generalizations. Most programs, however, attempt to place specific emphasis on a particular unit of analysis by controlling letter-sound relationships with substitution of correspondences in initial, medial, and final positions.

It is thus possible to view the decoding process as establishing an understanding of the relationship between grapheme-phoneme correspondences, which form the larger morphographeme and morphophoneme units which, in operational form, can in turn formulate the pronunciation of the vocalic-center group and, in some instances, the corresponding morpheme.

The Comprehension Process

In examining the process of comprehension the two general areas of relational meaning and lexical meaning are of primary concern. With the former one is concerned with the importance of structural relationships in sentences; and with the latter, the importance of semantic considerations realized through denotative and connotative meanings and nonlinguistic signs.

Research related to the comprehension process has been prompted by the extensive sentence knowledge which the English speaker possesses. For example, he can recognize grammatical from nongrammatical sentences, *The car struck the tree.* versus *The struck tree the car.;*

comprehend different sentences having the same constituent structures *John is eager to please.* versus *John is easy to please.;* identify ambiguous sentences with identical surface structure. *They are frying chickens.* versus *They are frying chickens.;* and understand sentences with similar meaning but possessing different surface structures, *The girl struck the robber.* versus *The robber was struck by the girl.* Additionally, the English speaker can comprehend as well as generate a phenomenally large number of novel sentences. These facts alone suggest that language production and comprehension must be characterized by a rule governing nature. But what evidence is present which will provide for the validation of language generalizations proposed by language scholars?

Relational Meaning - Surface Structure. Recent psycholinguistic research has sought to explore the psychological reality of surface structure constituents or the way in which language patterns tend to "chunk" into syntactic categories. Glanzer (*16*) has shown that pseudosyllable-word-pseudosyllable patterns are more easily learned when the connecting word is a function word (e.g., *of, and*) than when it is a content word (e.g., *food*). This finding supports the view that the resulting constituent group is a more natural word group and thus more easily processed.

The work of Johnson (*24*) dealing with a paired associate learning task has shown that adult subjects make a larger number of recall errors between phrases (e.g., *The valiant canary . . . ate the mangy cat.*) than within phrases (e.g., *The . . . valiant . . . canary,* etc.). This finding suggests that phrases may operate as psychologically real units. The experiment of Fodor and Bever (*11*) also supports this contention. In their investigation a clicking noise of brief duration was made as a sentence was read. Regardless of the placement of the click (e.g., during a word occurring immediately before or after a phrase boundary), the subjects indicated that the click occurred at the phrase boundary. Thus their conclusion supports the viewpoint that perceptual units correspond to sentence constituents as designated by the linguist.

The recent work of Ammon (*1*) has revealed that third grade and adult subjects require more time to process and respond to information which occurs across phrase boundaries than within phrases. In a similar study, Suci et al (*50*), reported similar findings and thus provide additional support for the sentence constituent as the processing unit for sentences.

Relational Meaning - Deep Structure. The transformational theory has proposed that sentences are processed from the surface structure level to an underlying or deep structure for comprehension purposes. This deep structure is realized through transformational and rewrite rules and is then integrated with the semantic component to convey meaning.

The work of Miller (*32*) has demonstrated that when subjects are asked to transform sentences from one form into another (e.g., active affirmative to passive or active affirmative to passive negative), a positive relationship is present between transformation time and the complexity of the transformation. This finding supports the contention that transformations possess psychological reality in that the greater the number of transformations the greater is the distance between the surface and deep structure of a sentence.

Mehler (*30*) has shown that after subjects have been asked to memorize a series of complex sentences varying in grammatical type, they tend to recall the sentence but in a simpler grammatical form. For example, a sentence in the passive may be recalled in its active form. These findings suggest that a recoding of the sentence has occurred and that the semantic form is maintained but the deep syntactic marker indicating the passive form has been forgotten.

The role of transformations in sentence comprehension has also been demonstrated in the research of Gough (*18*) and Slobin (*46*). These researchers have shown that sentence comprehension varies in increasing difficulty (speed in determining truth value of sentence) in the following order—active affirmative, passive, negative, and passive negative. Thus, the available evidence does give support to the reality of deep sentence structure. Additional support will be derived from the discussion of short- and long-term memory presented later in this paper.

Lexical Meaning. It should be obvious at this point that this discussion of surface and deep structure has placed little emphasis on the role of lexical meaning. Some evidence is present in the previously discussed work of Gough (*18*) and Slobin (*46*) to suggest the importance of this language component. It is of interest to note, for example, that passive sentences were comprehended with greater ease than negatives, even though the former are thought to be syntactically more complex. This unexpected finding may be attributed in part to the semantic difference between the passive and the negative and to the semantic similarity between the passive and the active. In instances requiring a true or false determination, negative sentences seem to be difficult to comprehend. Slobin has emphasized that not only is syntax important in comprehending sentences but semantic considerations must also be accounted for. His research has shown that the differentiation in difficulty between active and passive can largely be eliminated by clarifying the role of nouns in the subject and object positions. This clarification can be accomplished by reducing the possibility of semantic reversibility (e.g., Reversible: The *girl* struck the *boy*. The *boy* was struck by the *girl*. Nonreversible: The *boy* picked the apple. The *apple* was picked by the *boy*.) Such findings suggest that much more is involved in sentence understanding than in relational meaning.

One would expect structure words to play an important role in narrowing possible semantic alternatives in the sequence of a sentence context. For example, the word *the* not only cues a noun which follows but may also clarify or emphasize the semantic nature of the noun (e.g., *The* dog was in our yard versus *Some* dog was in our yard.) Miller (*32*) and Miller, et al (*34*), demonstrated that words in context following a similar grammatical pattern are perceived more accurately than when in isolation. These findings suggest that the contextual constraint serves to narrow the possible range of appropriate words. Additional support for the importance of context in narrowing semantic possibilities is found in the research of Goodman (*17*). He has shown that although children may be unable to decode words in isolation, they deal successfully with the same words in a running context. Research by Ruddell (*41*) has shown that reading comprehension of fourth grade children is significantly higher on passages utilizing basic high-frequency patterns of their oral language structure in contrast to passages using low-frequency and more-elaborated construction. These findings may be interpreted to support the importance of contextual associations which provide sufficient delimiting information to enable a child to determine the semantic role of a word and further to recognize and comprehend it in the sentence.

The importance of the connotative dimension of word meaning obtains support from the research by Samuels (*42*). Fifth and sixth grade subjects were found to perform significantly higher in comprehending a reading passage containing words of high association value than a control group reading a passage containing low association value words.

Although effort is being made in developing a semantic theory which parallels the previously discussed deep structure, progress has been understandably slow because of the extremely complex nature of relating the semantic and structural components. Katz and Fodor (*25*) have characterized the form of a semantic theory as linguistic description minus grammar. They have postulated that a semantic component in language serves to assign meaning to each sentence through semantic markers. For example, semanticists have constructed semantic categories such as object -- nonobject, animate - inanimate, human - nonhuman, and male - female. A semantic marker (*37*) such as *male* represents the concept of words like *man, boy,* or *father* in contrast to words like *cat, truth,* and *girl.* In some respects this approach resembles the game of 20 questions which provides for narrowing the definition of the meaning under consideration. A sequence of such semantic markers constituting the dictionary would thus provide a semantic reading and define the conceptual content of words. By then utilizing a set of projection rules, the readings of lexical items would be integrated with the grammatical relationships as indicated by the deep struture to

derive the semantic characterizations of sentence constituents. Postal (*37*) expresses the view that such characterizations will explain semantic properties such as ambiguity (e.g., I observed the ball.), paraphrase (e.g., John is a farmer. *John* is someone who farms.), synonymy (e.g., not living; dead), or anomaly (e.g., John married a potato pancake.)

A difficulty which is apparent in the Katz and Fodor discussion of sentence meaning is the ambiguity resulting from the limited sentence context. To use an example from Katz and Fodor, the sentence "The bill is large," can mean a sizeable debt or the unusual size of a bird's beak. To know that the sentence is ambiguous is only a first step toward the understanding of its meaning. The meaning difficulty is resolved in a larger verbal context such as "Oh, I see you bought a new dress," or "My, what an unusual bird." The ambiguity may also be accounted for in a nonlinguistic fashion if one is purchasing clothing at a store or visiting a zoo. To describe rules, however, which will define the larger verbal context and nonlinguistic meaning represents an enormous task for the psycholinguistic researcher.

Short- and Long-Term Memory. The importance of memory in language processing is also of significant concern as one considers surface and deep structure. Miller and Chomsky (*35*) have proposed that a short- and long-term memory are operative in language processing. It is further proposed that the limited short-term memory deals with the less complex surface structure of sentences while the long-term memory handles the more involved, deep structure of sentences.

Miller (*32*) has demonstrated that subjects have great difficulty in processing sentences containing self-embedded structures (e.g., The rat that the cat that the dog worried killed ate the malt, etc.) in contrast to right-recursive sentences (e.g., This is the dog that worried the cat that killed the rat that ate the malt, etc.) Because the deep structure of these sentences is identical, Miller attributes this variation in difficulty to the heavy demand placed on the short-term memory by the surface structure of the self-embedded sentence.

It would thus seem logical that because of the limited short-term memory (*33*), a deep language structure and a long-term memory component are essential for information processing over running discourse. The previously cited work of Mehler may be interpreted to support this viewpoint in that complex sentences presented to subjects were recalled in a simpler form. It would thus seem that after a sentence is processed in the deep structure, the underlying meaning is retained with little regard for the structure. It would also appear that the deep underlying structure is basic to comprehending sentences.

Affective and Cognitive Dimensions

Affective Mobilizers. A system of communication must in some manner account for an individual's interests, attitudes, and values which

become operationalized as his objectives and goals. As an individual confronts a verbal task, his motivation reflected in his persistence and drive is extremely important. This viewpoint is supported by Durkin's research (*8*) which has identified the preschool reader as an individual who is serious and persistent, possesses the ability to concentrate, and is of a curious nature. In a study of achieving and nonachieving elementary school readers, Kress (*27*) has reported that the former group demonstrated more initiative in exhausting solutions and was found to persist in problem solving under changing conditions. The research of Piekarz (*36*) has indicated that the high-level reader, in contrast to the inferior reader, provides significantly more responses in interpreting a reading passage, a trait thus indicating greater involvement and participation. The high-level reader is also more objective and impersonal in synthesizing information sought. The research of Athey (*2*) has demonstrated the importance of value systems as mobilizers for reading at the junior high school level.

One would also expect life objectives to influence an individual's store of concepts and in turn his semantic dimension of language processing. The reality of this view is reflected in functional varieties of language. The lexicon of the organic chemist varies markedly from that of the newscaster, and both in turn differ from that of the farm laborer.

The affective mobilizers operationalized as the objectives and goals of the individual would thus be expected to influence language processing at the surface-structure level, through the structural and semantic readings, and at the deep-structure level.

Cognitive Strategies. As an individual participates in the communication act, he is constantly required to perceive and organize experiences. He must develop a symbol-processing system which will provide for conceptualization of experience. Bruner, et al (*5*), have shown that a cognitive strategy is of basic importance to the conceptualization process. Kress (*27*) concluded from a concept formation study of elementary school children that achieving readers were superior to nonachievers in versatility and flexibility, ability to draw inferences from relevant clues, and ability to shift set when new standards were introduced. From an extensive review of research on conceptualization, Singer (*45*) concluded that an important dimension in comprehending language consists of changing, modifying, and reorganizing a previously formed concept.

Thus the cognitive strategy of an individual is considered to be operationalized as a process of evaluating the adequacy of information, data gathering, hypothesis building, organizing and synthesizing data, and hypothesis testing. Additionally, the utilization of these factors must be guided by a constant awareness of the need to shift one's strategy to account for other approaches to problem solutions.

A Systems of Communication Model

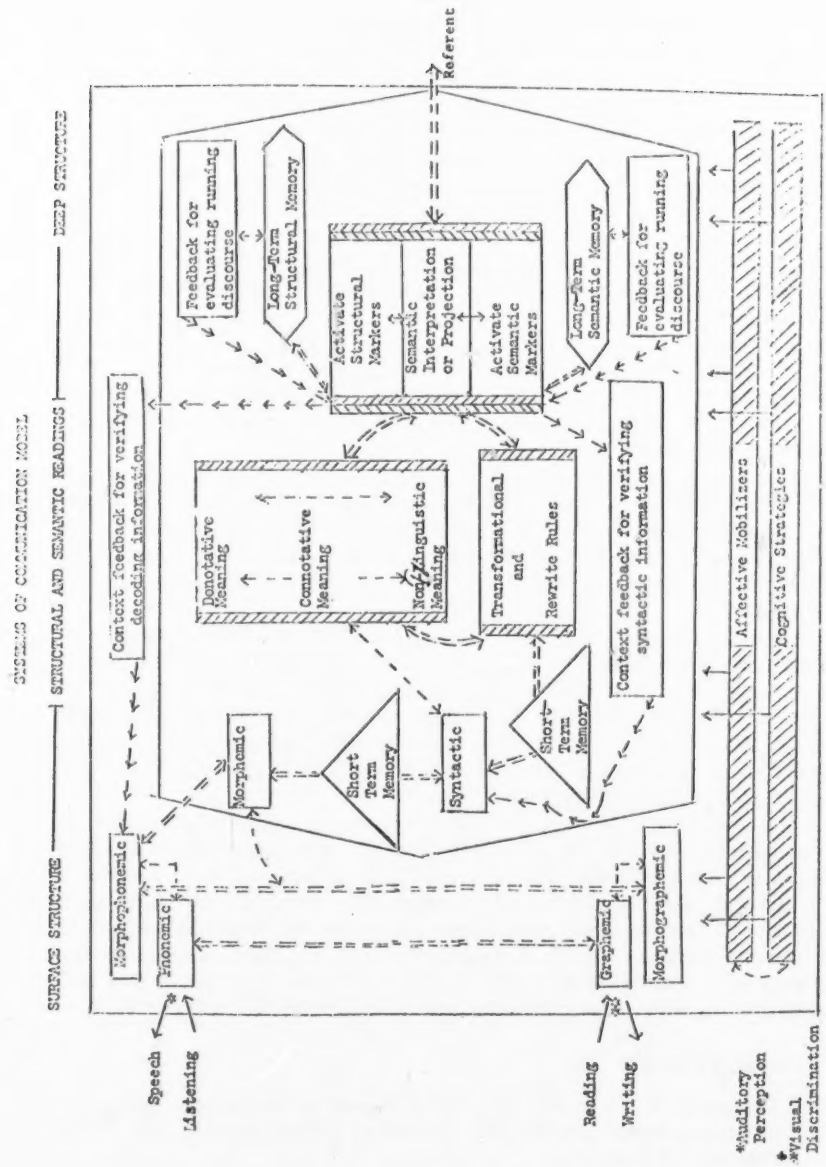
Although care must be exercised in attributing psychological reality to a competence model or linguistic description, the research presented in this discussion lends some degree of support to the reality of surface structure, language processing through structural and semantic readings, deep structure, short- and long-term memory, and the importance of affective mobilizers and cognitive strategies. Thus in a limited degree, evidence is present to suggest the general nature of a model of performance.

The language model is Figure 2 has been formulated in order to integrate the previous discussion and express relationships between the various psycholinguistic factors involved in the communication process. On the extreme left of the model the basic communication skills are identified while the referent appears to the extreme right and represents concrete objects, semiabstract, or abstract ideas in the physical world. The rectangular line encloses a hypothetical representation of the systems involved in encoding and production processes of speech or writing and the decoding and comprehension processes of listening or reading.

Near the bottom of the rectangle, the affective mobilizers and the cognitive strategies are noted. The mobilizers represent individual interests, attitudes, and values and become operationalized as goals and objectives in the communication setting. The strategies represent an individual's approach to the language-processing task as determined in part by his objectives. The vertical arrows are entered at key parts of the model from the affective and cognitive dimensions and indicate that during language processing the reader is constantly interacting with each phase of the communication model. These aspects of the model would enable the individual to shift his attention, for example, to the structural aspects of a sentence in order to obtain added relational data to determine the specific semantic dimension of a given word.

The model becomes more meaningful as the act of reading is traced through the various dimensions. In the early stages of reading, the child encounters the English writing system. The objective of the instructional program is to help him understand the nature of the code. This objective may be accomplished by establishing the relationship between the graphemic and morphographemic systems and the phonemic and morphophonemic systems, respectively. The development of cognitive strategies should lead the child to examine alternatives to decoding words. For example, after an unsuccessful attempt to utilize the grapheme-phoneme relationships in decoding, it may be necessary to examine clues at the morphographemic-morphophoemic level or to utilize the context feedback from the interpretation derived from the deep structure of the sentence. The more advanced reader may move directly from the morphographemic level through the morphophonemic system to the morphemic

Figure 2


SCHEMA OF COMMUNICATION MODEL
SURFACE STRUCTURE
STRUCTURAL AND SEMANTIC READINGS
DEEP STRUCTURE
Referent
Feedback for evaluating running discourse
Long-Term Structural Memory
Activate Structural Markers
Semantic Interpretation or Projection
Activate Semantic Markers
Long-Term Semantic Memory
Feedback for evaluating running discourse
Context feedback for verifying decoding information
Denotative Meaning
Connotative Meaning
Map/Linguistic Meaning
Transformational and Rewrite Rules
Context feedback for verifying syntactic information
Morphemic
Short Term Memory
Syntactic
Short Term Memory
Morphophonemic
Phonemic
Graphemic
Morphographemic
Affective Mobilizers
Cognitive Strategies
Speech
Listening
Reading
Writing
*Auditory Perception
*Visual Discrimination
Key: Primary Communication Line
Secondary Communication Line
Feedback Line

level or directly from the morphographemic level to the morpheme with a minimal use of the morphophonemic system (*10*).

The organized sound patterns directly involve the morphemic system. At this point the short-term memory is effected, and the syntactic system begins to "chunk" the language units through the constituent structures for transformational and rewriting purposes. Following the transformation and rewriting of the sentence in its most basic form, the semantic aspect of the model is encountered, and the meaning of the various morphemes are considered through a semantic reading utilizing the denotative, connotative, and nonlinguistic dictionary components. The semantic and structural meanings are then meshed through the semantic interpretation or projection rules, and the referent is established. Simultaneously, the appropriate semantic markers and structural markers are attached, and the semantic and structural contexts are placed in long-term memory. If at the point of semantic projection some difficulty is encountered and the sentence appears to be ambiguous, the reader may return to the morphophonemic level or the syntactic level to verify the surface structure realization for a specific morpheme or constituent structure, respectively.

As a new sentence appears in the running context, the communication is processed in the same fashion. Previous information, which has been stored in the long-term semantic and structural memories, is available for mobilization to the semantic-interpretation level to aid in evaluating the running discourse relative to the objectives established by the reader.

Just as one has examined the act of reading which involves the factors inside the rectangular line, one could proceed through the model in a similar fashion for the decoding and comprehension processes of listening. The encoding and productive processes of writing and speech can be examined by starting with the long-term semantic and structural memories, progressing to the semantic interpretation or projection, and moving from right to left through the model.

In conclusion, the field of psycholinguistics holds significant promise in developing an understanding of language processing which in turn should generate valuable knowledge about the reading process and other communication skills. This result is suggested in the overview of research presented in this discussion providing support for the psychological reality of selected linguistic units. Formulations such as those realized in the systems of communication model should enable reading researchers and specialists to work more profitably toward a theory of reading.

REFERENCES

1. Ammon, P. R. "The Perception of Grammatical Relations in Sentences: A Methodological Exploration," *Journal of Verbal Learning and Verbal Behavior* (in press).

2. Athey, Irene J. "Reading-Personality Patterns at the Junior High School Level," unpublished doctoral dissertation, University of California at Berkeley, 1965.
3. Bear, D. E. "Phonics for First Grade: A Comparison of Two Methods," *Elementary School Journal*, 59 (1958), 394-402.
4. Bloomfield, L. *Language*. New York: Holt, Rinehart and Winston, 1933.
5. Bruner, J., J. Goodnow, and G. Austin. *A Study of Thinking*. New York: Wiley Press, 1956.
6. Chall, Jeanne S. *Learning to Read: The Great Debate*. New York: McGraw-Hill, 1967.
7. Clifton, C., I. Kurca, and J. J. Jenkins. "Grammatical Relations as Determinants of Sentence Similarity," *Journal of Verbal Learning and Verbal Behavior*, 4(1965), 112-117.
8. Durkin, Dolores. "Children Who Learn to Read Before One," *Reading Teacher*, 14(1961), 163-166.
9. Downing, J. A. "The I.T.A. (Initial Teaching Alphabet) Reading Experiment," *Reading Teacher*, 18(November 1965), 105-110.
10. Edfeldt, A. W. *Silent Speech and Silent Reading*. Stockholm: Almgrist and Wiksell, 1959.
11. Fodor, J. A., and T. G. Bever. "The Psychological Reality of Linguistic Segments," *Journal of Verbal Learning and Verbal Behavior*, 4(1965), 414-420.
12. Fries, C. C. *Linguistics and Reading*. New York: Holt, Rinehart and Winston, 1963.
13. Gibson, Eleanor J., et al. "A Comparison of Meaningfulness and Pronounceability as Grouping Principles in the Perception and Retention of Verbal Material," *A Basic Research Program on Reading*. Ithaca, New York: Cornell University, Cooperative Research Project No. 639, 1963.
14. Gibson, Eleanor, J., H. Osser, and Anne D. Pick. "A Study of the Development of Gropheme-Phoneme Correspondences," *A Basic Research Program on Reading*. Ithaca, New York: Cornell University, Cooperative Research Project No. 639.
15. Gibson, Eleanor J., et al. "The Role of Grapheme-Phoneme Correspondences in the Perception of Words," *American Journal of Psychology*, 75(1962), 554-570.
16. Glanzer, M. "Grammatical Category: A Rote Learning and Word Association Analysis," *Journal of Verbal Learning and Verbal Behavior*, 1(1962), 31-41.
17. Goodman, K. S. "A Linguistic Study of Cues and Miscues in Reading," *Elementary English*, 42(1965), 639-643.
18. Gough, P. G. "Grammatical Transformations and Speed of Understanding," *Journal of Verbal Learning and Verbal Behavior*, 4(1965), 107-111.
19. Hahn, H. T. "Three Approaches to Beginning Reading Instruction," *Reading Teacher*, 19(May 1966), 590-594.

20. Hall, R. A., Jr. *Sound and Spelling in English.* Chilton Books, 1961.

21. Hansen, D. N., and T. S. Rodgers. "Exploration of Psycholinguistic Units in Initial Reading," in Goodman (Ed.), *The Psycholinguistic Nature of the Reading Process.* Detroit: Wayne State University Press, 1968, 59-102.

22. Hayes, R. B. "ITA and Three Other Approaches to Reading in First Grade," *Reading Teacher,* 19(May 1966), 627-630.

23. Jeffrey, W. E., and S. J. Samuels. "Effect of Method of Reading Training on Initial Learning and Transfer," *Journal of Verbal Learning and Verbal Behavior,* No.3, 7(1967), 354-358.

24. Johnson, N. F. "The Psychological Reality of Phrase-Structure Rules," *Journal of Verbal Learning and Verbal Behavior,* 4(1965), 414-420.

25. Katz, J. J., and J. A. Fodor. "The Structure of a Semantic Theory," *Language,* 39, No.2 (1963), 170-210.

26. Kelly, Barbara Cline. "The Economy Method Versus the Scott, Foresman Method in Teaching Second Grade Reading in the Murphysboro Public Schools," *Journal of Educational Research,* 51(1958), 465-469.

27. Kress, R. A. "An Investigation of the Relationship Between Concept Formation and Achievement in Reading," unpublished doctoral dissertation, Temple University, 1955.

28. Levine, H. and J. Watson. "The Learning Variable Grapheme-to-Phoneme Correspondences," *A Basic Research Program on Reading.* Ithaca, New York: Cornell University, Cooperative Research Project No. 639, 1963.

29. Mazurkiewicz, A. J. "ITA and TO Reading Achievement When Methodology Is Controlled," *Reading Teacher,* 19(May 1966), 606-610.

30. Mehler, J. "Some Effects of Grammatical Transformation on the Recall of English Sentences," *Journal of Verbal Learning and Verbal Behavior,* 2(1963), 346-351.

31. Miller, G. A. "Some Preliminaries to Psycholinguistics," *American Psychologist,* 20(1965), 15-20.

32. Miller, G. A. "Some Psychological Studies of Grammar," *American Psychologist,* 17(1962), 748-762.

33. Miller, G. A. "The Magical Number Seven, Plus or Minus Two," *Psychological Review,* 63 (1956), 81-97.

34. Miller, G. A., G. A. Heise, and W. Lichten. "The Intelligibility of Speech as a Function of the Context of the Test Material," *Journal of Experimental Psychology,* 41(1951), 329-335.

35. Miller, G. A., and N. Chomsky. "Finitary Models of Language Users," in R. D. Luce, R. Bush and E. Galanter (Eds.), *Handbook of Mathematical Psychology,* 11. New York: Wiley Press, 1963.

36. Piekarz, Josephine A. "Getting Meaning From Reading," *Elementary School Journal,* 56(1956), 303-309.

37. Postal, P. M. "Underlying and Superficial Linguistic Structure," *Harvard Educational Review*, 34(1964), 246-266.

38. Reed, D. W. "A Theory of Language, Speech, and Writing," *Linguistics and Reading*, Highlights of the Pre-convention Institutes. Newark, Delaware: International Reading Association, 1966, 4-25.

39. Rodgers, T. S. "Linguistic Considerations in the Design of the Stanford Computer Based Curriculum in Initial Reading." Institute for Mathematical Studies in the Social Sciences, Technical Report No. 111, USOE Grant Number 0E5-10-050, 1967.

40. Ruddell, R. B. "A Longitudinal Study of Four Programs of Reading Instruction Varying in Emphasis on Regularity of Grapheme-Phoneme Correspondences and Language Structure on Reading Achievement in Grades Two and Three." University of California, Berkeley, 1968. Supported by the USOE, Projects 3099 and 78085.

41. Ruddell, R. B. "The Effect of the Similarity of Oral and Written Patterns of Language Structure on Reading Comprehension," *Elementary English*. 42(1965), 403-410.

42. Samuels, D. J. "Effect of Word Associations on Reading Speed, Recall, and Guessing Behavior on Tests," *Journal of Educational Psychology* (in press).

43. Samuels, S. J., and W. E. Jeffrey. "Discriminability of Words and Letter Cues Used in Learning to Read," *Journal of Educational Psychology*, 57, No. 6. (1966), 337-340.

44. Silberman, H. F. *Exploratory Research on a Beginning Reading Program*, Technical Memorandum, No. TM-895/100/00. Santa Monica: System Development Corporation, 1964.

45. Singer, H. "Conceptualization in Learning to Read: New Frontiers in College-Adult Reading," in G. B. Schick and M. M. May (Eds.), *Fifteenth Yearbook of the National Reading Conference*. National Reading Conference, Milwaukee, 1966, 116-132.

46. Slobin, D. I. "Grammatical Transformations and Sentence Comprehension in Childhood and Adulthood," *Journal of Verbal Learning and Verbal Behavior*, 5(1966), 219-227.

47. Soffietti, J. P. "Why Children Fail to Read: A Linguistic Analysis," *Harvard Educational Review*, 25(Spring 1955), 63-84.

48. Sparks, Paul E., and L. C. Fay. "An Evaluation of Two Methods of Teaching Reading," *Elementary School Journal*, 57(April 1957), 386-390.

49. Smith, H. L., Jr. *Linguistic Science and the Teaching of English*. Cambridge: Harvard University Press, 1959.

50. Suci, G. J., P. R. Ammon, and P. Gamlin. "The Validity of the Probe-Latency Technique for Assessing Structure in Language," *Language and Speech*, 10(1967), 69-80.

51. Tanyzer, H. J., and H. Alpert. "Three Different Basal Reading Systems and First Grade Reading Achievement," *Reading Teacher*, 19 (May 1966), 636-642.

52. Venezky, R. F. "English Orthography: Its Graphical Structure and Its Relation to Sound," *Reading Research Quarterly*, 2(Spring 1967), 75-106.

53. Wardaugh, R. "Linguistics—Reading Dialogue," *Reading Teacher*, 21(February 1968), 432-441.

The Teaching of Phonics and Comprehension: A Linguistic Evaluation

RONALD WARDHAUGH
University of Michigan

An examination of the literature suggests that there are two major emphases in the teaching of reading. One of these is an emphasis on reading as the decoding of written symbols, that is, a concern with orthography. The other is an emphasis on reading for meaning, that is, concern with mental processes of a fairly high order. The distinction is not unlike the one often characterized in terms used in communication theory as that between the code and the message. When the reading researcher or reading teacher places emphasis on the code, there is likely to be a concentration on phonics, on phoneme-grapheme correspondences, on the improvement of the existing orthography, and on using oral reading as part of the teaching process. An emphasis on the message, on the other hand, will lead to a concentration on look-and-say techniques, on the importance of meaningful content, and on the avoidance of oral reading in favor of silent reading.

In practice most teachers seem to put some emphasis on both code and message although at times there have been some experts who have come out strongly in favor of one emphasis to the apparent exclusion of the other. In the teaching of beginning reading it is necessary to recognize both code and message, both the fact that in some sense the written language is a codification of the spoken language—that is, that the orthography is important—and the fact that the code is used to communicate, used to say something meaningful so that rather complex types of processing are required. It seems that in order to teach beginning reading successfully the methods used should be based on adequate notions of the relationship of sound and symbol in the first case and what has to be comprehended in the second. It will be the thesis of this paper that existing methods are based on notions which are far from adequate. The writer suggests that phonics instruction, the decoding

emphasis, is a mishmash of fact and fiction and the prevailing understanding of comprehension, the message emphasis, derives more from the mystical than the scientific sources of inspiration.

The general activity of reading will not be defined any more closely than in the preceding statements. If the definition there seems inadequate, no apologies are needed. Most definitions turn out to be inadequate because they are too vague (reading as getting meaning from the printed page), or too all-inclusive (reading as a psycho-neuro-muscular-socioeconomically correlated activity), or too utopian (reading as the key to better living in a better world filled with better prople), or, conversely, too narrow (reading as making Johnny bark at print or reading as high-speed recognition). None, other than these two claims will be made: First, no matter what else a definition of reading includes, it must recognize that there is a connection between English orthography and the phonological system of English; and, second, sentences have meanings that can be accounted for in terms of syntactic and semantic rules. The first of these claims will be discussed in connection with phonics instruction and the second in connection with the teaching of comprehension.

Phonics Instruction

In recent years three books have appeared which contained strongly phrased conclusions which were roughly the same. The first, Hunter Diack's *The Teaching of Reading in Spite of the Alphabet* (*8*), criticizes the reading research of recent decades (in fact, of the twentieth century) on the grounds that it has discovered very little of consequence. Diack comes to the conclusion that a satisfactory method for teaching reading would have to be based on a recognition of the alphabetic nature of English and would, to that extent, be a phonics method. Mitford Mathews, in his *Teaching to Read: Historically Considered* (*14*), is also critical of reading research and comes out in favor of phonics, or the synthetic plan as he calls it, because he claims that any objective research that has been done clearly favors that approach:

> The fact is well established that children taught by a carefully worked out synthetic plan read much better and read sooner than those taught by an analytic method, or by any combination of approaches in which the analytic element predominates. The evidence for this statement is abundant and is constantly being augmented. (p. 196)

Even more recently, Jeanne Chall, in her book *Learning to Read: The Great Debate* (*5*), written following a three-year study financed by The Carnegie Corporation, comes out in favor of a phonics approach in the teaching of beginning reading although not quite as definitely as either of the other two and with considerably more restraint in her method of argument.

All three of these authors make very much the same points: valid research evidence to support look-and-say and other whole-word methods over phonics does not exist and fair comparisons nearly always show phonics instruction to result in superior reading achievement later. Actually, this conclusion does not surprise a linguist, for it seems quite obvious to a linguist that such would be the case—that a method which shows children who are learning to read the relationship between sounds and symbols is more likely to be successful in beginning reading than other methods which almost entirely ignore such a relationship. But when the same linguist looks at what goes on in phonics itself, he generally cannot help but be disturbed, for it appears to him that if existing phonics methods are better than other methods in teaching beginning reading, how much better would be a phonics method based on linguistically defensible information. How much better it would be to base phonics on what one knows about language than to go on perpetuating the present content of phonics. If phonics does succeed, one must be paying a high cost for that success or else that success is a testimony not to the people who devised the phonics systems in use or wrote the books on phonics methods but to the children who learned to read "in spite of it all." But then never forget children cannot be stopped from learning—only hindered to a greater or lesser degree.

Now consider phonics as it is represented in some familiar books and articles. The first book is Roma Gans' *Fact and Fiction about Phonics* (*11*). Quite bluntly this book really contains more fiction than fact, for the author finds considerable difficulty distinguishing one from the other. She has no conception of how language functions or how a language itself is learned, and she has no ability to keep statements about sounds quite clearly differentiated from those about symbols. There is a completely uncritical treatment of the notions of long and short vowels and of syllabication; there is confusion about phonetic facts and the sound-spelling relationship; and throughout she never distinguishes statements about the intuitive knowledge people, including children, have about their language from those about conscious knowledge—that is, the knowledge they can verbalize. The book is almost valueless, and its title is most unfortunate. So, too, is the title of the next book, Arthur Heilman's *Phonics in Proper Perspective* (*13*), a book which contains many of the same misunderstandings and which is also of little value. The third book Cordts' *Phonics for the Reading Teacher* (*7*), is by far the best of the three. There is much less confusion and much more common sense about langauge in the book. Of course, there are unfortunate normative statements about correctness; and the notion of separating out the individual sounds of words, particularly final consonants which in normal speech tend to be very weakly articulated, for the purpose of sounding them out is extremely ill-advised; however, on the whole, the book far surpasses either of the other two.

These comments have, in effect, been a general condemnation of *phonics* instruction as represented in texts. What is the writer condemning? He is condemning the following kinds of statements because each is *linguistically* indefensible:

1. Statements about letters having sounds; as for example, "these letters must be blended to arrive at the correct sound." Letters are letters and sounds are sounds; they must not be confused with each other.

2. Statements about syllabication which apply only to word-breaking conventions in printing when these statements are made into rules of pronunciation, as when *butter* is broken into *but* and *ter* and *monkey* into *mon* and *key*. There is only one medial consonant in *butter*, and its phonetic quality derives from its relationship to both vowels in the word, not just the first.

3. Statements about slurring, poor enunciation, incorrect articulation, and mispronunciations, as when *doing* is said to be "*incorrectly*" pronounced if said as *doin'*. A whole set of such shibboleths exists.

4. Statements about "long" and "short" vowels, as when *mad* is said to have a short vowel and *mate* a long vowel (even though in any pronunication the writer has heard the second vowel is shorter in duration than the first!). Allophonic vowel length depends on whether the vowel is final or non-final in a word or whether it is followed by a voiced or voiceless consonant. There might be something like "long" and "short" vowels in English, but they are nothing like those in the books on reading.

5. Statements about teaching children the sounds of their language as though they did not already know these (for how else could they speak?).

6. Statements which do not allow for well-known dialect variations, as when the word *when* is always taught as /hwen/ no matter which part of the United States the child comes from, or *due* as /dyuw/ or *pin* and *pen* which cannot be /pin/.

The preceding is just a list of some of the readily observable weaknesses of the phonics instruction that has proved, according to Diack, Mathews, and Chall, to be *superior* to other kinds of instruction. It is a mixture of fact and fiction. Description and prescription go hand-in-hand, but the teacher apparently never knows which is which. Speech and writing are confused. The teaching of reading is associated with the teaching of some kind of proper language, but the latter is never precisely defined. Worse still, there is more teaching about what the writer will call an artificial and haphazard set of observations, or generalizations, than teaching of the desired responses.

There is actually what purports to be serious research conducted into the problems inherent in phonics instruction. Of course, given the nature of the phonic just described, there will be lots of problems, most

of them created by the instruction itself. Four articles published in *The Reading Teacher* in recent years have shown how different investigators have researched what have become known as "phonic generalizations." I am referring to the series of articles by Clymer (*6*), Bailey (*1*), Emans (*9*), and Burmeister (*3*). What these investigators looked at was a set of statements which in many cases are clearly worthless and hardly require any examination at all. Some are valueless because they fly in the face of linguistic common sense: for example, "In many two- and three-syllable words, the final *e* lengthens the vowel in the last syllable" (note the confusion of sound and symbol); or "If the last syllable of a word ends in *le*, the consonant preceding the *le* usually begins the last syllable" (note the blind acceptance of the so-called rules of syllabication). Others obviously require ordering so that a statement such as "The *r* gives the preceding vowel a sound that is neither long nor short" must precede the statement that "When a vowel is in the middle of a one-syllable word, the vowel is short." However, these two rules are not ordered, nor is ordering even considered. The generalizations seem to be a haphazard set in which rules about accent, word-splitting, silent letters, and special combinations are presented randomly and without motivation. Burmeister's conclusion that not many of them are very useful is hardly surprising, for surely no child can ever learn to read by applying a set of rules of this kind. The research itself hardly seems to be justified, for it seems obviously unlikely that children can learn to read by applying such rules; and this unlikelihood should override any desire to make simple-minded counts to determine how valid each rule is when representative texts are examined. Surely it would have been far wiser to have ordered the rules in some way, reduced their number considerably, and thrown out the obviously indefensible ones—or, better still, to have investigated *just which rules children actually do use* by studying their so-called errors, their miscues in Goodman's terminology in word attack.

That the linguistic content of the present phonics programs and methods is highly suspect there can be no doubt. How much faith can one have in a program which claims in its advertising that "Phonics begins with the second word the child sees. These are the *first two words* in the *first preprimer: Mike, Mary*"? Or in another program with its advertising claim that reads as follows:

> Hearing and saying the sounds of standard American English are today recognized as two of the most important fundamental components in the complex of learnings we call language skills. They are particularly important to the child whose language experience has been limited or has been primarily in a dialect at variance with standard American English. Yet the child's ability to hear and say these sounds with accuracy is basic to his ability to learn to read and write, and to successfully perform many other school tasks. We must face the fact, too, that many

> teachers speak in regional dialects differing in some degree from the standard language we hear on radio, television, movies and other media of mass communication. Because of this many teachers are hesitant to offer their pupils systematic phonics instruction.

In the first case, surely phonics must make better use of principles of selection and gradation of materials than to choose such words as *Mike* and *Mary* to begin with; and, in the second, surely a teacher using a phonics program must differentiate clearly between the teaching of reading and the teaching of some artificial dialect probably of little value to children who already speak a fully functioning dialect of their own. The writer would suggest that such programs as these are almost certain to cause problems in reading, not eliminate them!

It is not surprising that several linguists who have turned their attention to the teaching of reading should have concentrated on phonics or something resembling phonics. Bloomfield (*2*) was highly critical of existing phonics instruction. His position has been stated by Barnhart in his promotional literature for *Let's Read: A Linguistic Approach.*

> A phonic system starts from the written language and teaches a child to learn to read as if he had never learned to talk. It asks him to produce isolated sounds and to combine them, which is a meaningless exercise that can only delay the child in learning to read.

The Bloomfield system is not phonics as phonics is usually described. There is no sounding out, and any interpretation which suggests that Bloomfield believed in sounding out (other than getting children to name the letters they see to insure that they can discriminate the letters) is completely false. Fries, in his *Linguistics and Reading* (*10*), also opposed phonics instruction; in fact, he devoted the whole of his fifth chapter to the proper definition of three important terms: *phonics, phonetics* and *phonemics*. The writer would recommend this chapter as required reading for all reading teachers. Like Bloomfield, Fries insisted on recognition of whole words and was opposed to sounding out. Instead he stressed the contrast, oral and visual, of pairs of words such as *mat, met* or *fat, fate*. In both cases the method has come to be known as linguistic rather than phonic although little reason can be found for this distinction except for purposes of differentiation. If children are to be taught to associate sounds and spellings, then such teaching has to be based on good descriptions of the sound and spelling systems of English and of their relationship. Bloomfield and Fries offer reasonably valid statements of this relationship—that is, given certain assumptions of a kind rather different from those which many linguists accept today. They are not carried away with irrelevant issues about long and short vowels, syllable divisions, normative judgments, and so on. In addition, they propose some principles of gradation and contrast which might be useful and oppose others, such as "sounding out," which are very likely to be

harmful. Their linguistic method is a variety of good phonics; other people's phonics is almost certainly very poor linguistics.

It is fortunate that today there is at least one reasonably sound approach available which goes a long way to meeting the kind of objectives Bloomfield and Fries had to phonics—that is, the Initial Teaching Alphabet. Used by teachers who avoid the worst prescriptions of phonics, this alphabet has much to recommend it. Certainly, it has its inconsistencies. Nevertheless, it is a rather laudable attempt to help children make some kind of sense out of English orthographic conventions in their attempt to learn to read—and that *is* phonics.

Anyone seriously interested in teaching children to read must be prepared to acquire a knowledge of the phonological system of English. He must also find out how that system is represented in English orthography; how people, particularly six-year-olds, actually speak; and how such speech varies in the different dimensions of social and regional dialects. He must also become aware that children know their language when they come to school (for they can speak) and that grammatical and lexical knowledge as well as phonological knowledge is brought by children to the task of reading. In one sense i.t.a. over-differentiates since it ignores this latter fact, just as did Bloomfield and Fries. Actually, traditional phonics shows more awareness of the importance of root words and derivational patterning (except in the thankfully moribund use of "finding little words in big ones") than did the linguists who have written about phoneme-grapheme correspondences. In other words, not all of phonics is bad. Fortunately, linguists today have realized some of the inadequacies of the notion of the phoneme held by such men as Bloomfield and Fries and go so far as to claim that the standard traditional English orthography is not at all a bad representation of English phonology. They also make the very interesting claim that it is useful regardless of dialect, so long as it is treated as a representation of important underlying contrasts and not as a representation of surface peculiarities.

Undoubtedly the best known analysis of English spelling patterns available to teachers is that by Venezky (*15*). In this analysis Venezky discusses the purely orthographic conventions; such as, the use of letters like *x* and *q* and combinations like *th* and *ch*, the predictable alternations between *u's* and *w's* and *i's* and *y's*, the basis for so-called long-short distinctions in pairs like *hater* and *hatter* and *diner* and *dinner*, and some of the other interesting morphophonemic alternations in English, as in *sign* and *signal*, *bomb* and *bombadier*, and *autumn* and *autumnal*. Venezky's analysis is very much in keeping with current developments in linguistic thought and is hereby recommended to anyone who wants to put phonics onto a respectable basis.

The writer has dwelt at length on phonics because of the widespread support that phonics instruction is finding in the reading literature, in the

press, and even at professional meetings. Although this support is understandable, the writer feels that phonics should be based on better linguistic information than it is at present. If a bad phonics has proved to be more successful in beginning reading instruction than any other method, how much better would a good phonics be! Turning briefly to comprehension, One will see something of the same weakness in current understanding of comprehension and discover how it might be improved.

Comprehension

The process of comprehension is often characterized as one of gathering thought from the printed page or of fusing the meaning of words, generally in some cumulative linear fashion—whatever these notions mean. Buswell (*4*), for example, wrote that the unit in reading materials was the same as the unit in speech, namely, the word; and he said that reading was a process of fusing single words into a sequence of meaning. Now these notions are palpably inadequate. First of all, there is an over reliance on naive ideas about words. Words are important grammatical units in English, but they are not the same units in every case as those found in the dictionaries our students use! One does not understand sentences by adding together the meanings of words in the same way that beads are added together on a string to make a necklace. These definitions about gathering thoughts and fusing meanings do not tell anything interesting at all. To understand the act of comprehension one needs some idea of the components of sentences which are important in making sentences meaningful. Until one has a characterization of what is involved in comprehension, one cannot make any very interesting statements about comprehension. All one can talk about is success or failure in gross terms or types of error without having any precise notion as to the specific sources of difficulty. Current linguistics does offer some understanding of the act of comprehension in that it has something to say about these components. It is not a complete understanding and has more to say about the fundamental syntactic and semantic relationships in sentences than how these actually constitute component parts in any psychological process of comprehension.

In order to fully comprehend a sentence, a reader must be able to relate what many linguists now call the deep structure of that sentence (that is, its basic elements and their relationships), to its surface structure (that is, the representation of that sentence on the printed page). The reader must also be able to project a consistent semantic reading on the individual words. He must do more than react to the surface structure of a sentence alone (that is, do more than recognize individual letters, words, and superficial syntactic patterns). To do only this much is to bark at print. Genuine comprehension requires that each sentence be given both syntactic and semantic interpretations in depth. And this is an active process in which the reader makes a great contribution and

by no means a passive process as it has sometimes been said to be by certain linguists.

To illustrate consider the following five sentences and an over-simplified discussion of them to make the basic points:

1. The man stole the car.
2. The car was stolen.
3. Who stole the car?
4. What did the man steal?
5. What was stolen?

The first sentence demands that the reader understand that *The man* is the subject; the deep subject of the sentence of which *stole the car* is the predicate, and *the car* is the deep object. The second sentence has a surface subject *The car* but the real subject, the deep subject, is an unspecified SOMEONE. *The car* is actually what was stolen so SOMEONE stole it and *the car* is still the deep object. The deep structure accounts for the fact that a correct interpretation of *The car was stolen* requires an understanding that an unspecified person did the stealing and that this person stole the car. The other sentences are understood as follows: Sentence three is a question about SOMEONE who stole the car and seeks the identity of that SOMEONE. Sentence four is also a question but this time seeks the identity of the stolen SOMETHING (we do not know what it is) and specifies who the guilty party was. Contrast sentence five in which the guilty party or what was stolen are not specified at all.

These five sentences have been analyzed in an extemely simple way, but the principle is clear: in teaching comprehension one must understand exactly what must be comprehended. And it is not just *words*. A good part of what must be comprehended must be accounted for by a knowledge of the deep syntactic relationships in the sentences presented for comprehension. Another part of what must be comprehended can be accounted for if one has a parallel knowledge of the semantic projections which are possible; one can account in some systematic or principled way for the different readings of *play* in the following sentences:

6. He wrote a fine play.
7. He made a fine play.
8. All she does all day is play.
9. The wheel has too much play.

Notice the semantic relationships and/or constraints between *wrote* and *play* in sentence 6, between *made* and *play* in sentence 7, and between *wheel* and *play* in sentence 9. Sentence 8, on the other hand, seems neutral. Current linguistic investigations promise some help in coming to a better understanding of what is involved in teaching comprehension

than presently held. It must be emphasized once more that the descriptions of the syntactic and semantic systems which linguists offer are just that and no more. They are descriptions of linguistic abstractions and not of psychological processes; however, they might well provide the bases for an understanding of such processes. They do at least warn against thinking of comprehension as some kind of mystical process which one has no hope of examining and against giving an unhealthy emphasis to words, words, words at the expense of other far more important units and processes.

Conclusion

The writer has been critical of two of the basic areas of reading instruction, the teaching of phonics and the teaching of comprehension. It is because he finds them to be the two critical areas in reading as judged by reading specialists themselves and, therefore, the two most in need of care and attention. They are also the two areas in which it would seem that more success can be achieved through rather basic and simple reorientation. Phonics is not rejected; but phonics without a linguistic basis is rejected. Neither is reading for meaning rejected—only the teaching of children to read for meaning when the teacher herself does not know how sentences achieve meaning. Again linguistics has something to say about sentence meaning.

Good materials and good methods must reflect good linguistic knowledge. Following are five principles for developing good materials and methods for teaching reading:

1. They must be based on sound linguistic content, that is, on the best available descriptions of language—and of the English language in particular—rather than on random collections of myths. One needs scientific knowledge, not folklore. One has to be prepared to read what the linguists are telling about English phonology, orthography, syntax, and semantics.

2. They must be based on a sound knowledge of the relationships and differences between sounds and symbols, between speech and writing. Linguists talk about some basic dichotomies; one must be sure about them, too.

3. They must be based on a thorough understanding of just what children know about their language as this knowledge reveals itself in what they can do in their language rather than in what they can verbalize about their language. This distinction is an extremely important one and one which is hardly ever made in discussions of beginning reading. Six-year-olds are sophisticated users of the language. How many readers can handle a foreign language with the same ease and assurance as first grade children handle English, even when these children are from culturally different environments?

4. They must differentiate between the descriptive and the prescriptive, particularly when the prescriptions are unrealistic. When the prescriptions refer to standard English, the methods and materials should reflect some decision about the relationship *(if any)* between teaching reading and teaching a standard spoken dialect. It may well be that standard English orthography is perfectly adequate for teaching reading to speakers of *any* dialect of English, and more than one linguist known to the writer would be prepared to argue for just such a proposition.

5. Finally, they must recognize the important active contribution the learner makes in reading, both in trying to make sense of the orthographic conventions of English and in trying to make sense out of sentences. Too often one rewards the learner's correct responses and punishes his incorrect ones. Good methods and materials should focus on these incorrect responses, or "miscues" in Goodman's terminology (*12*), for they can tell just as much as one will let them tell; and they probably tell a great deal, for they are anything but random.

Hopefully, one will soon learn to stop counting the uncountable, defending the indefensible, and teaching the unteachable. Instead, let one set the reading house in order by being very sure that the substance of the discipline is solid and not shadow as at present. Perhaps if one could be sure of this—and the writer believes the knowledge to make it so is there if one would just seek it—methods and materials will improve and one will not have to devote so much time and expense to remediation, reading clinics, dropouts, and educational failure of all kinds. Educators might ask themselves if it is not the case that the greatest number of reading failures are due to the methods and materials being used. If this is true, educators should resolve to do something about it now.

REFERENCES

1. Bailey, Mildred H. "The Utility of Phonic Generalizations in Grades One Through Six," *Reading Teacher,* 20(1967), 413-418.
2. Bloomfield, Leonard, and Clarence L. Barnhart. *Let's Read.* Detroit: Wayne State University Press, 1961.
3. Burmeister, Lou E. "Usefulness of Phonic Generalizations," *Reading Teacher,* 21(1968), 349-356, 360.
4. Buswell, Guy T. "The Process of Reading," *Reading Teacher,* 13(1959), 108-114.
5. Chall, Jeanne. *Learning to Read: The Great Debate.* New York: McGraw-Hill, 1967.
6. Clymer, Theodore. "The Utility of Phonic Generalizations in the Primary Grades," *Reading Teacher,* 16(1963), 252-258.
7. Cordts, Anna D. *Phonics for the Reading Teacher.* New York: Holt, Rinehart and Winston, 1965.
8. Diack, Hunter. *The Teaching of Reading in Spite of the Alphabet.* New York: Philosophical Library, 1965.

9. Emans, Robert. "The Usefulness of Phonic Generalizations Above the Primary Grades," *Reading Teacher*, 20(1967), 419-425.
10. Fries, Charles C. *Linguistics and Reading*. New York: Holt, Rinehart and Winston, 1963.
11. Gans, Roma. *Fact and Fiction about Phonics*. Indianapolis: Bobbs-Merrill, 1964.
12. Goodman, Kenneth S. "Reading: A Psycholinguistic Guessing Game," *Journal of the Reading Specialist*, 4(May 1967), 126-135.
13. Heilman, Arthur W. *Phonics in Proper Perspective*. Columbus: Charles E. Merrill, 1964.
14. Mathews, Mitford M. *Teaching to Read: Historically Considered*. Chicago: University of Chicago Press, 1966.
15. Venezky, Richard L. "English Orthography: Its Graphical Structure and Its Relation to Sound," *Reading Research Quarterly*, 2(Spring 1967), 75-105.

END